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NOVEMBER, 1934

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Where Architects and Engineers Fit Into Modernization

◆

BY far the greater part of the modernization of buildings resulting from the Better Housing Campaign inaugurated by the Federal Housing Administration will involve dwelling houses of the single-family type.

◖ It may be taken for granted that comparatively few of these numerous small contracts, which average around $400, will utilize the services of architects.

◖ Modernization of industrial and business buildings, on the other hand, do require the services of both architects and structural engineers.

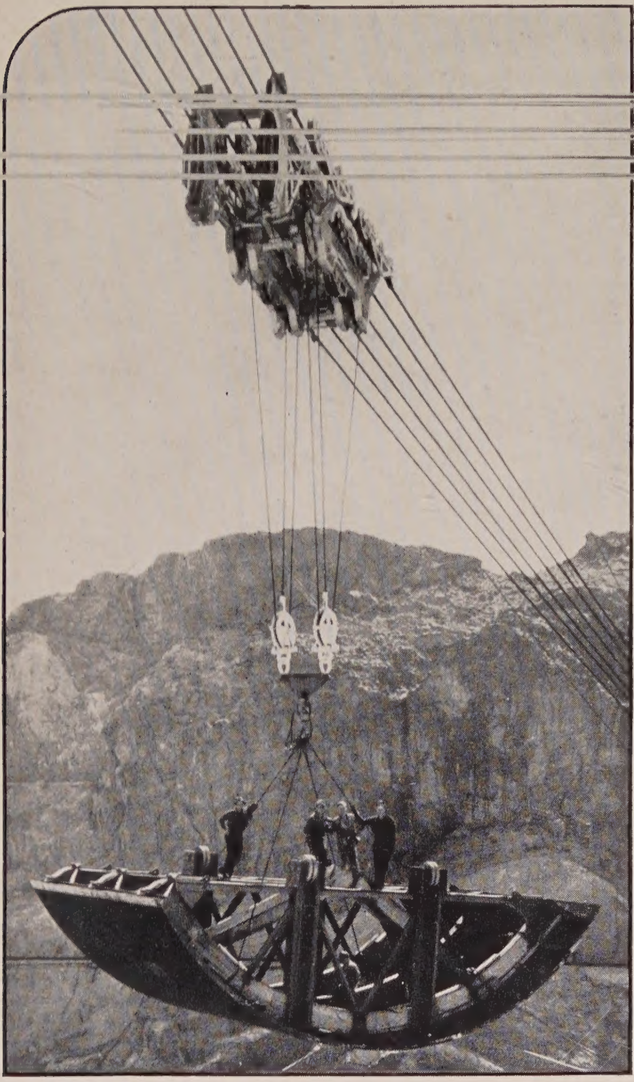
◖ The leading article in this issue is a notable example of this type of modernization—a drab factory building located at the intersection of two boulevards, now modernized with architectural concrete and the grounds landscaped, all in complete harmony with the location.

◖ The design of new fronts for retail stores and commercial garages offers another field for the services of architects, while both architects and structural engineers may participate in the modernization of the interiors of old fire-traps in the rim of buildings bordering the retail sections of our cities—buildings occupied by wholesale houses, printing establishments, and the like.

◖ The leading article in the April (1934) issue of "Concrete" deals intelligently with rehabilitation of the last-named type.

◖ Personal interviews with owners of business and industrial properties may result in a much larger number of commissions for rehabilitation work of this kind.

THE AIR ROADS ARE ALWAYS OPEN



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Vol. XLII, No. 11 Concrete November, 1934

Modernize Old Industrial Plant with Monolithic Concrete

All Exterior Decorative Work Is Concrete Cast in Place in Special Molds — How Plaster Molds for Architectural Concrete Were Made

THE adaptability of monolithic concrete to the modernization of an industrial building is most effectively illustrated in the renovated and enlarged industrial plant of the Republic Flow Meters Company, of Chicago. The "before-and-after" views here illustrated offer convincing testimony to this effect.

The location of this plant at the intersection of two boulevards—Diversey Parkway and Logan Boulevard—made it particularly unfortunate that the old plant, to say the least, was not a credit to the community. It was a plain factory type of building, designed from the standpoint of utility alone.

New Front on Old Building

The old plant, in reality, consisted of two buildings, the two together forming an "L." The modernized plant comprises principally an addition, built along the fronts of the old buildings. In a word, the new construction is also L-shaped, built within the old "L," and forming a most attractive "front" for both of the old buildings. The new addition and the alterations to the two old buildings have transformed the entire plant into what is virtually a single structure.

It was through the suggestion of Henry Dubin, of the architectural firm of Dubin & Dubin, of Chicago, that the officials of the Republic Flow Meters Company became interested in the method of treatment that was actually followed in constructing this striking monolithic concrete building. Their first idea was merely to build another brick addition to the old plant.

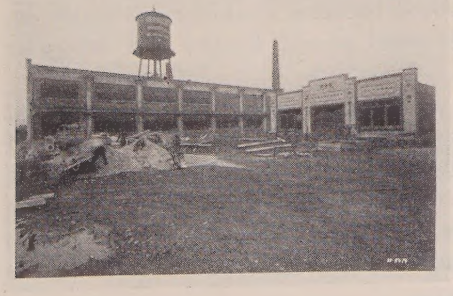
Tower to Be Added

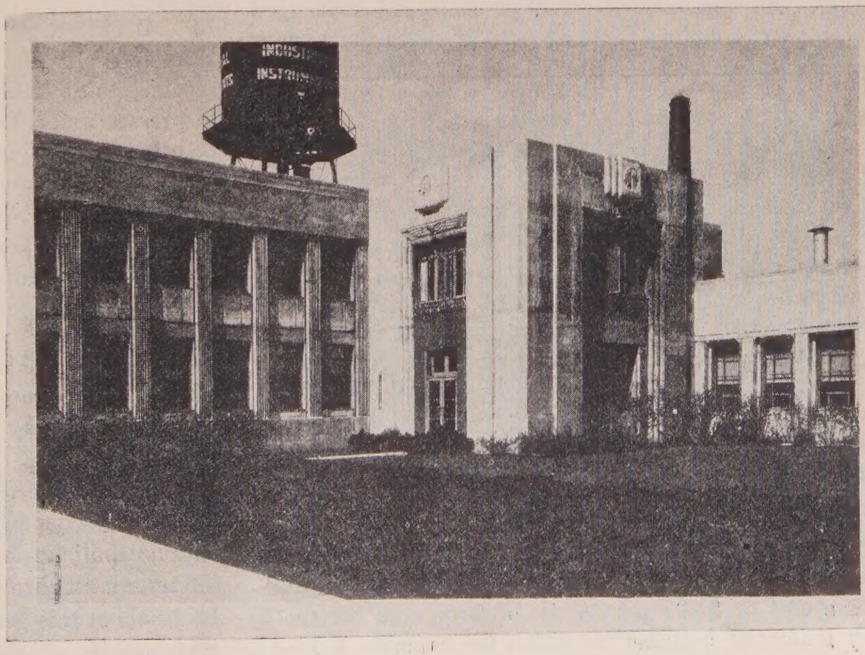
The full story is not told by the illustrations here shown, for the square structure in the interior angle of the "L," shown conspicuously in the center of the illustration on the right, was designed as the base of a tower. This upward extension will soon be added, and it will house and conceal the water tank now seen in both pictures. The base of the tower—the part now built—is occupied by the executive offices of the company. The total new floor area added amounts to 5,000 sq. ft.

Ornamental Concrete Cast in Place

All of this work, including all the ornamental features, such as the panels above the tower windows, and the fluted columns at the sides of the windows, is of monolithic concrete—cast in place on the job.

The plant of the Republic Flow Meters Company, as it appeared until recently, and as it appears now with a new "front" of monolithic reinforced concrete





The surfaces of walls and pilasters are true and smooth, and corners are clean-cut and straight, because of the care taken with the construction of form work, and the further fact that all flat form surfaces were lined with masonite.

Molds for Ornamental Concrete

Molds for the fluted columns at the sides of the window openings were made of corrugated iron, set and secured in place, after which the regular form work was built around them.

Molds for the decorative panels above the window openings in the tower were likewise set in place, and the regular form work was built around them; but for this decorative work plaster molds were used.

How Plaster Waste Molds Were Made

The usual procedure was followed in the design of the decorative panels and the preparation of the plaster waste molds.

First, the decorative panels were molded in clay by a sculptor. From these clay models the plaster reverse molds—known also as waste molds—were made, and were sized with two coats of thin shellac to prevent the absorption of moisture from the concrete coming into direct contact with the molds. This is a very important detail, for if the molds were not coated with shellac, and if they happened to be well dried out when concrete was placed in them, they would have absorbed water from the concrete. This would have left the concrete nearest the mold surface without sufficient water for complete hardening.

The plaster molds were reinforced with steel to permit handling without danger of breaking, and wooden strips were cast into the back of the molds to facilitate the work of securing them to the regular form work. After the molds were securely fastened within the framework of the forms, the regular form work was built around them.

Facing the Decorative Concrete

Special attention was given to the placing of the concrete in the decorative panels and the other ornamental work. No special aggregates were specified. Gravel and torpedo sand of the kinds frequently employed in building construction in Chicago were used in all this work; but for the ornamental work the coarser particles of gravel were omitted. That is, a mixture of concrete in which the aggregates were sand and pea gravel was first applied to the surfaces of the decorative molds, in a manner similar to applying a dash coat of stucco. Then the mold was completely filled with the regular mixture of concrete. By having this finer material at the surfaces, the ornamental work was sharp and clean-cut.

Plaster Molds as Protection

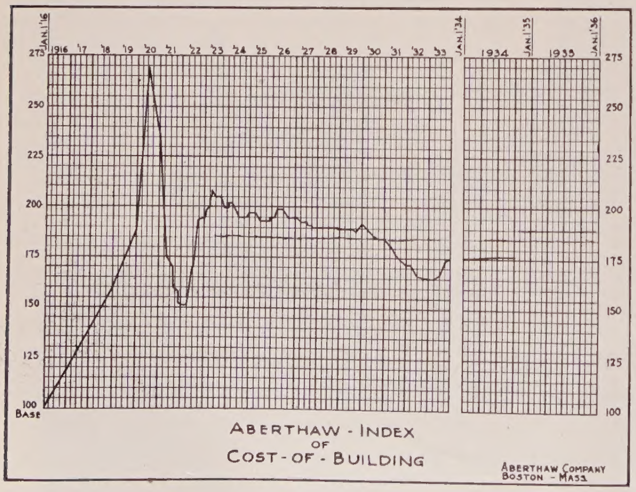
The plaster waste molds were left in place until the exterior wall construction was practically completed. This permitted the ornamental concrete to cure under ideal conditions, and it also protected this concrete from accidental damage during construction operations. By that time the concrete had hardened sufficiently to permit the plaster molds to be broken away without endangering this ornamental work. After the molds were broken away the surface of the decorative concrete was cleaned off with wire brushes.

The open space in front of the building, facing the intersecting boulevards, is being landscaped with a lawn, flowers, a privet hedge, and a row of Lombardy poplars.

Acknowledgment: The architects of this building are Dubin & Dubin, of Chicago. Edward Chassaing made the clay models for the decorative work. The general contract was held by the H. B. Barnard Construction Company, with R. W. McKinstry in charge as construction superintendent.

Aberthaw Index of Building Cost

THE regularity in construction costs that has prevailed since the beginning of this year continued unchanged for the quarter ending September 30, the Aberthaw Index of cost of building remaining at 176½. This value indicates a cost of $1.85 per sq. ft. of floor area for the 7-story industrial building on which the estimate is based.

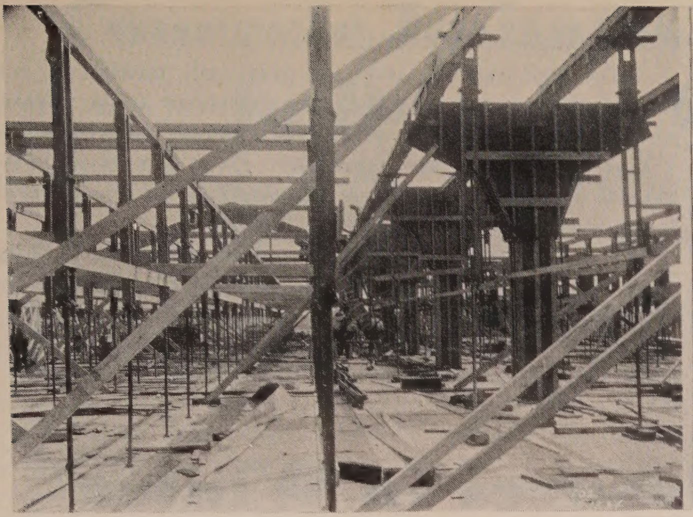


Big Nation-Wide Housing Plan Reported Under Preparation

A MATTER of the utmost interest to the building industry is the following "flash" from the Brookmire special report received on October 27: As this copy goes to press a report from Washington states that the Administration is drafting a plan for an enlarged housing program to be presented to the next Congress.

The details are not available at this time but the announcement testifies to President Roosevelt's determination to stimulate building activity. The need for revising the durable goods industries in order to accelerate the economic recovery is winning increasing recognition, and the possibility in residential building would be materially enhanced if the government should finance and otherwise encourage housing construction.

The "summary" of the same report also declares that in a broad sense the welfare of the building and related industries is dependent upon the existence of under-lying national policies favorable to capital expansion. So these interests must throw their suport behind any movement to bring about this general condition as well as to tackle the more specific problems.



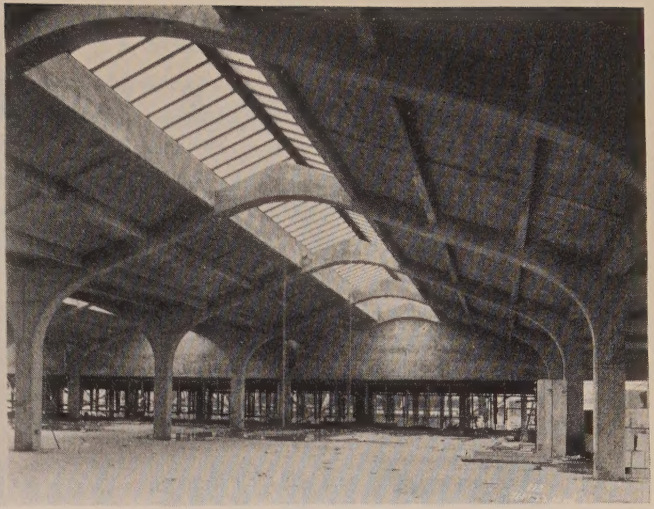


Figure 1, at left: Pre-fabricated plywood form units were quickly assembled. Figure 2, at right: Excellent example of rigid-frame construction with plywood forms

New International Livestock Pavilion Is Built of Concrete

Replaces Building Destroyed in Chicago Stockyards Fire—Rigid-Frame Design and Precast Concrete Roof Slabs Are Features—Plywood Forms Given Five Re-Uses

A NEW International Livestock Exposition Pavilion of reinforced concrete, with a steel arched roof covered with haydite concrete slabs over the arena, has replaced the building that was completely destroyed in the $8,000,000 fire at the Union Stock Yards in Chicago on the afternoon of May 19 of this year.

As stated in an illustrated article in the August issue of CONCRETE, page 22, building after building of combustible construction was completely consumed in the wind-driven fire. Reinforced concrete structures, though subjected to the severest fire tests, suffered no structural damage. One of the destroyed structures was the predecessor of the new building here described, known by the shorter name of International Pavilion.

Upper Story of Rigid-Frame Construction

The new structure consists of a central arena flanked along its two sides (north and south) by 2-story wings of reinforced concrete construction. The first story columns and the second floor, upon which exhibits of heavy machinery will be held, are of flat-slab reinforced concrete, designed in accordance with the Chicago city building regulations.

The upper story of the two wing structures, comprising the second-story columns and the roof, are of rigid-frame reinforced concrete construction. That is, each row of columns and the roof girders spanning the space between columns are designed as a multiple-span rigid frame, with columns restrained at the base, where they are, of course, continuous with the circular flat-slab columns of the first story. This rigid-frame construction is shown in Figure 2. The roof slab itself is of reinforced concrete, as may be seen in Figure 2.

Plywood Form Units Built on Ground

The smooth surfaces and the sharp corners obtained in the concrete shown in Figure 2 were obtained by the use of plywood for the concrete form work in all parts of this project. The assembly of the plywood form work is shown in Figure 1. These forms were assembled in large units that were built on the ground by the form carpenters in an adjoining burned-over space. These form units were built in accordance with shop details, so that their assembly in the structure involved comparatively little labor. Patented adjustable shores (shown in Figure 1) were used along with straight studs and liners, while all the sheathing was of plywood.

Five Re-Uses of Plywood Forms

The entire contact area of form work amounted to 1,125,000 sq. ft., and this work required 250,000 sq. ft. of plywood. This indicates that an average of nearly five re-uses was obtained with this material—an exceptionally good record when the complicated character of the form work is taken into consideration, together with the fact that these wing buildings are only two stories high and each story is of a different type of construction.

The seat construction along the sides of the arena is also of reinforced concrete, though in this part the principal girders are concrete-incased structural steel. The plywood was supplied by the Harbor Plywood Corp., of Chicago.

Mixing and Distribution of Concrete

The principal concrete mixing plant consisted of a Ransome paver which discharged into a hoist bucket at the base of a tower. The bucket was elevated to the necessary floor level, where the concrete was discharged into a hopper and was distributed in buggies operating over runways. The concrete when placed, was subject to the action of Mall vibrators of the high-frequency type.

Visual inspection of the concrete where forms have been stripped indicates that it is of excellent quality, of high strength and a high degree of density.

Roof Slabs of Precast Concrete

The roof over the arena, as previously mentioned, consists of steel arch ribs spanning the entire arena, covered with precast slabs of reinforced concrete, in which haydite was used as the aggregate. These precast slabs—a total of 3,200 units—were manufactured by the Federal-American Cement Tile Co., of Chicago.

This interesting structure was designed by A. Epstein, structural engineer, of Chicago, and the contractor is the Poirot Construction Co., also of Chicago. The building is approaching completion and is expected to be ready for the livestock exposition to be held in December.

Heating the Inclosures in Winter

Number of Salamanders Required—Precautions Taken to Avoid Premature Drying of Concrete—When May Heating Be Discontinued?

WHEN concrete is placed in ordinary structures such as buildings and retaining walls, the freshly placed floors and walls usually are exposed on two sides. When concrete is placed in such structures during cold weather the heat of hardening is rapidly dissipated, even when the form work is left in place.

Inclosure Must Be Kept Warm

In consequence, the work must be inclosed with canvas or by similar means, and the inclosure must be kept warm until the concrete has hardened to the point where it will no longer be damaged by freezing.

The temperature within the inclosure must be held at not less than 60 deg. F. during the required hardening period. It is well known, from practice and experiment, that the rate of hardening of ordinary portland cement concrete is quite perceptibly slowed down if the temperature of the air in contact with the concrete falls below 50 deg. F. Good cold-weather construction practice calls for some margin of safety above this critical temperature, so that 60 deg. F. is generally recognized as the minimum that should be allowed within the protecting inclosure.

It is important that the inclosing canvas be kept a few feet away from the sides of walls, and a few feet above floors, so that the warm air may circulate freely around the concrete that is being protected.

Keep Salamanders Away from Concrete

The most common method of heating inclosures is with coke-burning salamanders, though kerosene-burning salamanders are also coming into favor.

It is extremely important that the salamanders be kept far enough away from any fresh concrete to prevent its overheating and premature drying out. Otherwise it will be found that an area of concrete nearest the salamander will attain but little more strength than putty, because the heat dried out the mixing water before it could combine with the cement. To avoid such damage, salamanders must be kept well away from walls, and if set on floors they should be the ordinary type that is mounted on legs.

Special Arrangement for Lifting Salamanders

A special arrangement for handling salamanders is employed by a large contracting firm. In this arrangement the salamanders are suspended on light chains from the shoring timbers of the form work. The chain-and-pulley arrangement permits the salamanders to be lowered for firing, after which they are drawn up again to a position well up toward the freshly concreted floor. This elevated position of the salamanders raises the temperature immediately beneath the floor.

Number of Salamanders

When using coke as fuel, the quantity of smoke and fumes may be held to the minimum by firing frequently with small amounts of dry coke.

In building construction work one salamander should be supplied for every 180 sq. ft. on each story being heated. The salamanders must be set up beneath the floor to be concreted, and they must be fired before the actual placing of the concrete is started.

Instead of using salamanders for heating an inclosure, live steam is often used, perforated pipe lines being laid within the inclosure. The source of the steam is, of course, the same source that supplies steam for heating the aggregates and mixing water. An important advantage of this method is that the warm, moist air resulting from the presence of steam provides ideal curing conditions.

When May Protection Be Discontinued?

In order to determine definitely when protection against cold weather may be discontinued, a safe method is to make test cylinders or cubes taken from the concrete as it is actually being placed, and storing the test specimens within the inclosure. These test specimens should be placed near the edge of the inclosure, on the windward side, so that the conditions of exposure will be as severe as for the most exposed concrete in the structure. Compression tests will then determine the probable strength of the least hardened concrete in the structure. Ordinarily, the compressive strength of these test specimens should be at least 1,500 lb. per sq. in. before heating may be discontinued.

Concrete Imitates Rock Formations in Dens for Wild Animals

Bear and Lion Dens at Chicago Zoological Park Have Appearance of Natural Homes—Procedure Followed in Construction

ROCK-LIKE formations built of concrete, having the appearance of igneous rock intrusions pushed up through the earth's crust by great natural forces, comprise the most prominent features of the new Chicago Zoological Park, recently opened in a 196-acre tract at Brookfield, a western suburb of Chicago. Both architects and contractors will be interested in the details followed in obtaining these realistic effects.

One group of these rock-like structures, or masses, comprises the bear dens. The second group provides realistic dens for lions, tigers, pumas and hyenas. The third imitates a natural home for rock-climbing goats.

The average visitor to the park may not recognize these massive features as anything but natural stone, though he may be puzzled as to the method employed in transporting them to this location and setting them in place.

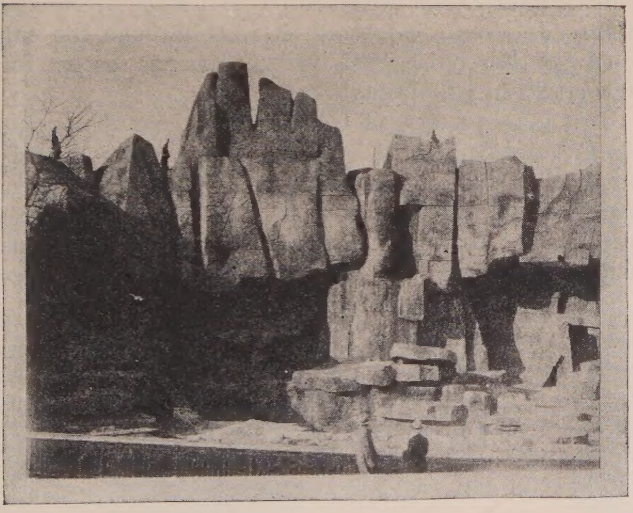


Figure 1. Bear dens in newly-opened Chicago Zoological Park at Brookfield, Illinois

Six-Inch Shell of Reinforced Concrete

More critical inspection will disclose that the supposed rocks are, in fact, built of reinforced concrete and "gunite." The latter is simply a special form of reinforced concrete placed by shooting sand-and-cement mortar through a gun driven by compressed air. The architect or contractor who may have a valid reason for inspecting this construction from the interior will discover that the main masses of "rock" are well-reinforced and well-supported shells of concrete or "gunite" no more than 5 or 6 in. thick.

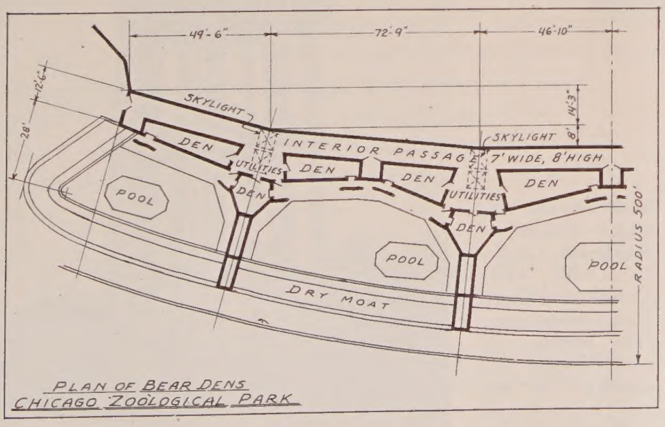
From the accompanying drawings, showing the plan of a part of the bear dens, and a cross-section through the portion assigned to the polar bears, some idea may be obtained of the manner in which these unusual features were built.

Small-Scale Models Built as First Step

First of all, models were built to a scale of one inch to the foot, and from these models the working drawings were prepared for the construction of the continuous moat in front of the dens, the interior passage within the "rock" ridge, the smaller dens, the swimming pools, and other walls and slabs shown in solid black in the drawings. The walls and slabs comprising the parts just enumerated, including the cantilever slab extending upward and forward from the front wall of the main interior structure, are of ordinary reinforced concrete construction and were built in the usual way on a separate contract. Some of the steel rods used as reinforcement in the front wall and the cantilever slab were made to project from the concrete, to assist later in supporting the outer rock-like shell.

The Construction Procedure

It was here that the ingenuity necessary to create these rock effects began to play its part. The irregularly shaped wall or shell shown in the cross-section as extending



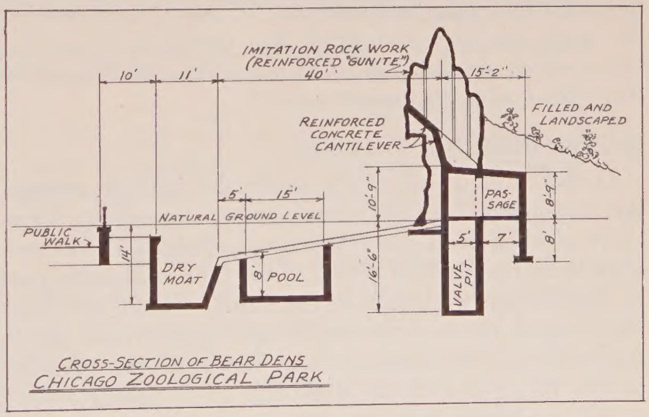


Figure 2. (Left) Plan of bear dens, Chicago Zoological Park. Figure 3. (Right) Cross-section through den for polar bears, in Chicago Zoological Park

downward from the upper end of the cantilever to the floor of the den, to form the face of the "cliff," was the first part of this special work to be built. This shell, like the rest of the imitation rock construction, is from 5 to 6 in. thick, reinforced with closely meshed metal lath. In the actual construction of the shell the first action taken was to place the metal lath that was to form the steel reinforcement. This lath was bent into shape in accordance with the outline indicated by the model, and firmly wired to the steel rods which, as previously mentioned, projected from the front wall and the cantilever slab.

A Scratch Coat of Plaster

A scratch coat of portland cement plaster was then applied by hand trowels to the metal lath, to provide a surface for the beginning of operations with the cement gun. The gun was first brought into action from the inside of the shell, where a coating of "gunite" about 1 in. thick was shot onto the metal lath to protect the latter from rusting. Then several successive coats of "gunite" were shot onto the outside surface of the shell, until it was built up to a total thickness of 5 or 6 in.

Placing the Finish Coat

In the construction of the bear dens the final coat of colored cement mortar was then hand-troweled into place, by workmen skilled in this type of work. At the lion dens the final coat was shot on with the cement gun. In both cases the final touches were added by a craftsman brought from Switzerland to supervise this part of the work. With a hand trowel he marked lines to represent seams and lines of cleavage, and added other characteristic markings of igneous rocks. The natural appearance of the work is due in considerable part to the skill employed in adding these final touches.

Peaks Supported on Concrete Posts

The peaks and other parts of the work above the interior passage and the cantilever slab consist of shells of a thickness and construction similar to that of the walls that form the face of the cliffs, just described. Here the metal lath was bent and fastened into place, as before, in accordance with the shape of the small-scale model. This part of the work is supported in part by the top slab of the reinforced concrete structure, in part by the cantilever slab, and in part by posts built up from these two slabs. These posts, likewise, were built of closely-meshed metal lath, concrete and "gunite." The lath for the posts was bent and wired into the form of circular tubes, which were then filled with concrete and the outside was coated with the cement gun.

Definite Plans Not Possible

In the construction of the moat, the interior passage, the cantilever slab, and other features consisting essentially of reinforced concrete walls and slabs, it was possible to follow definite plans, of the kind ordinarily used in construction work; but in the construction of the shells representing the rock masses, definite plans could not be followed, and none were drawn. The structural planning of this latter part of the work had to be solved as construction proceeded, the small-scale model serving mainly as the guide. Whenever special difficulties were encountered, the various heads responsible for the work went into a huddle and found a way to overcome the trouble.

It was necessary to avoid the creation of pockets in which rain-water and melted snow might collect and cause trouble. Where such pockets were unavoidable, as around the skylights in the top slab over the interior passage, drainage was provided.

Lighting, Drainage and Water Supply

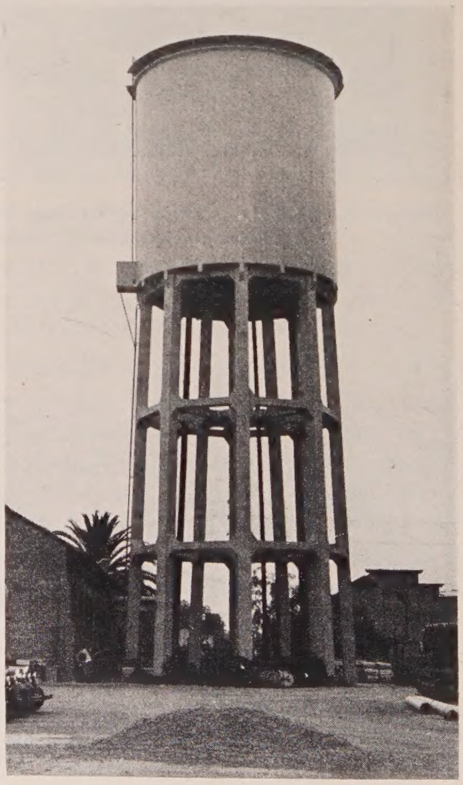
While the plan here illustrated does not show the lighting, the water supply, or the drainage, these facilities are all provided, and are controlled mainly from the spaces marked "Utilities." Whenever it is necessary for an attendant to enter the open-air portion of a den, for the purpose of cleaning or repair work, the animals are lured into one of the concealed dens with fresh meat, after which the door to the den is closed by means of a long rod, extending to it from the nearest "Utilities" space.

Edwin H. Clark, a well-known landscape architect of Chicago, planned and supervised this interesting work.

Old Concrete Water Tower Resists Earthquake

TWENTY-SEVEN years of service, without showing any indication of leakage and requiring very little maintenance, is the creditable performance shown by the reinforced concrete water tower and tank at Anaheim, Calif. To crown its record, it went through the earthquake of March 10, 1933, without damage, except for a few cracks in a horizontal beam.

Last winter a crew of CWA workers gave the structure its first overhauling in 26 years. This work consisted of applying a coat of cement paint to improve the appearance and to seal the cracks in the beam caused by the earthquake. It was not necessary to cut out and replace any concrete.



Built for the city water system of Anaheim, Calif., in 1907, this concrete tank has given perfect service. It suffered no damage in the earthquake of March, 1933

New Cement Mortar Projector Repairs Illinois River Locks

Government Engineers Employ Mortar Pumping Equipment with Successful Results — Water Introduced at Nozzle — Operation Is Continuous

A NEW type of cement mortar projector, known as the "gunitor," was recently purchased and employed by the Chicago District office of the U. S. Engineers in the resurfacing of the concrete locks at an Illinois River dam at Marseilles, Ill. The locks were built about 12 years ago, and required repair at some points where frost action had spalled off the surface.

In the coating work on the locks, the manufacturer's recommendations were followed, and the results obtained were satisfactory in every way. The mortar mixture included pea gravel as a small-size coarse aggregate.

Operation of Projector

The illustration shows the operating equipment used in the work at Marseilles. The dual hopper-like unit on two wheels, at the right and nearest to the camera, is the "gunitor." The mortar mixture was forcibly shot against the old concrete surface through a 1¼-in. hose and a ¾-in. nozzle tip, by means of compressed air. The aggregate and cement are pumped through the hose in a dry condition, but suspended in the compressed air. Water is introduced at the nozzle, the quantity of water introduced being under the constant control of the operator.

Mechanical Features of "Gunitor"

The "gunitor," as the illustration shows, consists of two hopper-like chambers, one upper and one lower. The dry material — cement, sand and pea gravel—was placed in the upper (or charging) chamber, from which it was fed mechanically into the air stream. Operation was continuous, since the lower chamber continued to discharge while the upper one was being refilled.

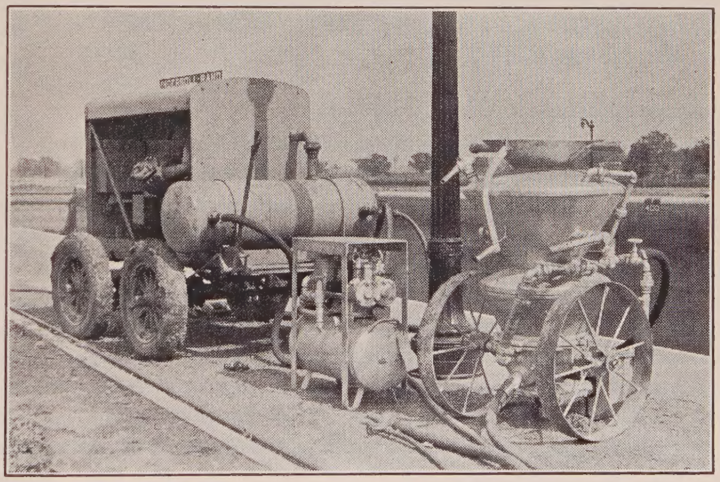
The "gunitor" used on the Marseilles locks is known as Type A-2-A, weighing 650 lb. and utilizing 125 cu. ft. of compressed air per minute of operation. The air compressor used, shown farthest from the camera in the illustration, is an Ingersoll-Rand two-stage air-cooled compressor, operating at 100 lb. pressure. This was sufficient to hold the "gunitor" at from 32 to 35 lb. pressure, which was found to be ample for this kind of work.

Forcible Application Creates Dense Coating

Between the "gunitor" and the compressor is the water pump, a duplex steam pump also operated by compressed air. This pump lifted water from the canal and supplied it to the "gunitor" nozzle at a uniform pressure between 50 and 60 lb.

Before application of the new coating of cement mortar, the old concrete surface was prepared by being cleaned and by chipping away all concrete that disclosed indications of spalling or disintegrating. The force by which the new coating was applied created a strong, dense mortar which adheres tenaciously to the old surface.

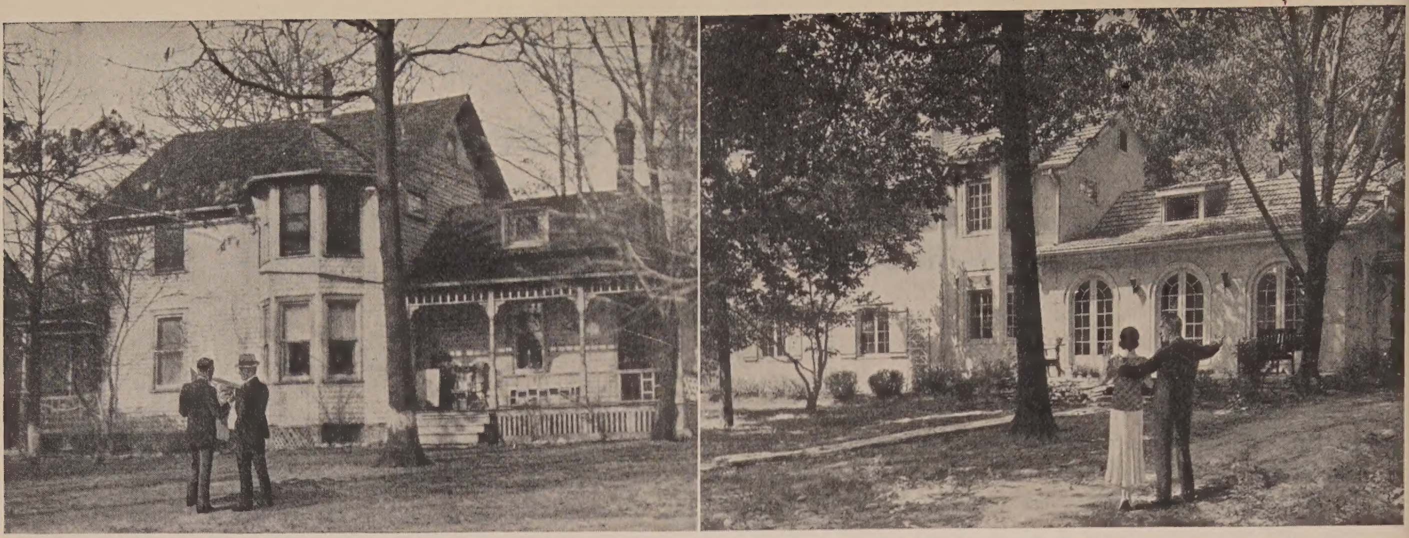
Acknowledgments. The "gunitor" employed in the repair work here described is manufactured by The Gunitor Company, Elkhart, Ind., of which C. L. Dewey, well known to the concrete construction industry, is president and general manager. The work on the locks was under the direction of Major Donald H. Connolly, district engineer, Chicago office, U. S. Engineers, and under the immediate supervision of E. H. Beechley, area engineer at Joliet, Ill. The government engineers are making preparations for a more extensive test of this equipment in the repair of massive concrete wall construction on several Illinois waterway structures. They expect also to use this equipment for other purposes, such as sand-blasting rust and scale from steel gates, structural steel, barges, ship bottoms, and other cases where steel surfaces need cleaning in preparation for applying paint or other surface protection. For such work, ordinary building sand is used and water is introduced at the nozzle, thus providing a wet sand blast that avoids the dust nuisance.



New type of mortar projector, or "gunitor," operating on repair work at Illinois River locks at Marseilles

New ASTM President

Dr. Hermann von Schrenk, consulting timber engineer, St. Louis, Mo., and senior vice-president of the American Society for Testing Materials was elected to the office of president on October 9. This action was taken by the Executive Committee to fill the vacancy caused by the death of *W. H. Bassett* who passed away on July 21. *H. S. Vassar* has been appointed senior vice-president.



"Before-and-after" pictures are the best sales argument. Portland cement stucco, concrete steps, a new foundation and a concrete basement floor caused this transformation

Hook Up with the Housing Campaign

How Architects, Engineers, Contractors and Products Manufacturers May Profit from the Better Housing Program of FHA

THE Better Housing Program sponsored by the Federal Housing Administration by authority of the National Housing Act of 1934 offers a definite opportunity for profit to architects, contractors, and concrete products manufacturers, and, to a lesser extent, to structural engineers.

Remembering to Help Yourself

Assuming that a local Better Housing Campaign has been organized, just how can these groups—architects, engineers, contractors and products men—fit into the local activities in a way that will help the campaign and help themselves at the same time?

Let us assume that the local campaign is well organized and in the hands of a competent local committee. Headquarters have been established. A "better-housing" exhibit has been organized. A bureau of information on financing has been set up. Lists of architects, engineers, contractors and suppliers of building materials have been posted at headquarters.

Architects and Engineers

Here, then, is what local architects and engineers may do toward helping themselves as well as helping to push along the whole program:

(1) Co-operate with contractors, retailers and material producers and dealers in preparing plans and estimates.

(2) Offer your services as a consultant at the local campaign committee headquarters.

(3) Be certain that your name is on the lists posted at headquarters.

(4) Publish plans and designs of modernization work, and popular articles dealing with technical questions.

(5) Supply the publicity committee at local headquarters with news stories and "before-and-after" photographs of work.

Contractors and Products Manufacturers

Aside from taking an active part in getting the local campaign organized and operating, contractors and products manufacturers should give their attention to the following activities through which they may profit from the modernizing program:

(1) Hire salesmen to solicit work or to sell materials. Spend more personal time in actual selling.

(2) Advertise your services or your products in local newspapers, over the radio, and in movies.

(3) Use direct mail to advertise your services or your products.

(4) Make check lists of the sort of modernizing jobs you can do, or for which your products are best fitted. See that all your salesmen have copies of this check list, and that they know how to use them in suggesting modernizing ideas to property owners.

(5) Canvass the entire neighborhood when you are working on, or supplying material for, a job. Show this work to your prospects. The fact that you are in the neighborhood and that your services or materials are readily available may lead to more business.

(6) Give written and definite estimates on work or materials.

(7) Use Housing Program posters on your trucks and on your jobs, as well as in your office.

(8) Attend all meetings of committees on which you hold membership, and attend public meetings.

(9) Take before-and-after pictures of your jobs, and supply prints to your salesmen and to the local publicity committee.

(10) Participate in the local "Modernization Exhibit," if one is held.

(11) Join and take an active part in your local trade association and help make plans to "follow through" to get more work after the local campaign is ended.

◆ EDITORIAL ◆

More Concrete in Architecture

THE adaptability of concrete to numerous forms of architectural expression is a subject that is receiving increasing attention from progressive architects; and contractors, on their part, are broadening their knowledge of the working procedure that brings out the best qualities of this material.

This issue of "Concrete" contains two articles in which the construction of architectural concrete work is described. One of these articles tells how the ornamental work on a monolithic concrete industrial building was designed and built, while the other describes the design and construction of rock-like animal dens in a zoological garden. Other articles in future issues will supply architects and contractors with further information on the how-to-do-it phases of architectural concrete.

Then, purely from the standpoint of effects obtained, an illustration of an outstanding example of cast stone will be found on page 13 of this issue. Future issues will carry equally striking examples of other forms of architectural concrete.

Architectural concrete is a fascinating study—one that is making an appeal to a constantly increasing number of architects and contractors.

Re-Housing as a National Policy

IN a recent memorandum addressed to President Roosevelt the New York membership of the National Public Housing Conference has set forth the need for the adoption of a program of slum clearance and re-housing as a permanent national policy.

While commending the practical and educational work already accomplished toward laying the ground work for such a policy, this organization concludes that the time is now ripe for emergence from the experimental period. It would pass beyond the present demonstration projects and develop a broad, permanent program through a federal division of housing, located either in the Department of the Interior or the Department of Labor.

The memorandum to the President recommends that the housing division be vested with power to make grants for low-cost housing projects out of funds appropriated by Congress, to make loans at low interest rates and for long amortization periods, to buy the bonds of housing authorities or similar agencies, or to issue its own bonds.

One of the principal duties assumed by such a housing division would be that of formulating a long-range national housing program involving, among other things, the demolition of unfit housing, the clearance, replanning and reconstruction of slum areas and the construction of new low-rent housing.

The housing division would give encouragement and active assistance in the creation of local public housing agencies throughout the nation.

It will be seen from the article printed in this issue, under the heading "Reorganized Housing Division of PWA Begins Slum Clearance," that this division of the PWA has made very definite progress in the direction of the greater program urged by the New York members of the National Public Housing Conference. But the fact remains that the present program of the PWA can only touch the high spots.

Through the acceptance of slum clearance and rehousing as a national responsibility and a national opportunity it will be possible to enlarge the program to the vastness envisaged by this group.

The Way of Common Sense

THERE is little likelihood that we shall again experience the type of jerry-building that was running rampant in the uncontrolled and uncontrollable building boom of the nineteen twenties. The penalties of that particular form of dishonesty have been so bitter and so costly that the public will not soon forget them.

But we are still far from the construction Utopia —where good workmanship can be taken for granted. Honest and responsible contractors still need protection against the cheater who comprises the doubtful fringe of the contracting industry.

It is, therefore, a matter of lively interest to know how the Germans, in their thorough-going way of doing things, have succeeded in escaping from the jerry-builder in carrying out that nation's construction program of 3½ million homes built under government supervision since the world war.

The problem is handled in a very direct and simple manner, according to Dr. Ernst Kahn, a German housing authority who recently visited the United States. Contractors, he said, are required to give a guarantee of sound workmanship, the guarantee covering a period of two or three years. Defective workmanship usually shows up within that time, and the contractor is required either to correct it or to forfeit his guarantee.

Under this procedure, very little defective workmanship is encountered, for the occasional contractor who may ordinarily be inclined to cover up faulty construction knows that he is running too great a risk.

Is there any valid reason why responsible contractors in this country should not be given the protection resulting from this common-sense procedure?

PROGRESS—In a Page

Current activities in research, in matters pertaining to concrete and cement, as being carried on or completed by various organized groups.

Canadian Standard Specifications

THE quarterly *C. E. S. A. Bulletin*, Vol. 8, No. 2, published by the Canadian Engineering Standards Association, National Research Building, Ottawa, Ontario, Canada, contains a new list of the association's publications.

Among the standard specifications listed, the following pertain to cement or concrete, or concrete reinforcement:

(1) A5-1927. Standard Specification for Portland Cement (second edition).

(2) C14-1924. Standard Specification for Reinforced Concrete Poles.

(3) A23-1929. Standard Specification for Concrete and Reinforced Concrete. Price $1.00.

(4) G30-1930. Standard Specification for Billet-Steel Reinforcing Bars (second edition).

(5) G31-1930. Standard Specification for Rail-Steel Reinforcing Bars (second edition).

(6) G32-1930. Standard Specification for Steel Wire for Concrete Reinforcement (second edition).

Copies of these standard specifications may be obtained from the association for 25 cents each, except as noted in the case of A23-1929, the price of which is $1.00.

Series of Newspaper Articles on Concrete Farm Structures

A NEW series of articles describing and telling how to build permanent farm improvements has been written by W. G. Kaiser, nationally known farm expert, agricultural engineer and manager of the cement products bureau of the Portland Cement Association, Chicago. These articles, illustrated to show construction stages, will be available for publication soon by periodicals and newspapers with important farm circulations.

In this series, Mr. Kaiser deals with types of construction that will improve sanitary conditions and raise the quality of stock and produce with a view to larger profits. At the same time, Kaiser recognizes that such improvements must be built with the utmost economy. For this reason he has detailed the most economical methods of carrying on these projects.

Concrete construction people in agricultural sections are urged to communicate with Mr. Kaiser at 33 W. Grand Ave., Chicago, with the view of arranging the use of these articles in local newspapers.

Safe Handling of Explosives

TECHNICAL men representing the various companies of the Institute of Makers of Explosives have just completed the important work of drawing up instructions and rules for consumers, in transporting, storing, handling and using high explosives and permissible explosives. Their work has been approved by the Institute as a body, and has been published in a 6-page printed folder of a size convenient for insertion into letters.

These instructions and rules are not intended as complete instructions for transporting, storing, handling and using high explosives, but are primarily meant as safety precautions which should be observed for properly and safely handling explosives.

The first section of the folder relates to storing and keeping explosives. Another brief section relates to thawing. Still another section covers the use of explosives, and discusses priming, charging, tamping and firing. This last is illustrated with small drawings showing priming. Finally, there is a revised list of "Don'ts."

Copies of the printed folder may be obtained from the Institute of Makers of Explosives, 103 Park Avenue, New York, N. Y.

Pipe Committee Active

COMMITTEE C-13 on Concrete Pipe, of the American Society for Testing Materials, will be actively engaged during the coming year on plans to harmonize certain differences between the specifications for reinforced concrete sewer pipe and the requirements for concrete culvert pipe. It has been suggested that the design and test requirements for extra-strength sewer pipe and standard culvert pipe be made the same.

An item on this page in the September issue of CONCRETE discloses the fact that this committee is preparing a complete revision of the tentative specifications for reinforced concrete culvert pipe. The committee is basing its studies on a great amount of test data obtained from highway departments, manufacturers, and others.

M. W. Loving, secretary of the American Concrete Pipe Association, 33 W. Grand Ave., Chicago, Ill., is secretary of Committee C-13.

Testing Special Types of Concrete Walls

THE engineering experiment station at the University of Illinois is conducting a series of tests, under the direction of Prof. F. E. Richart, to determine the strength and the sound-proofing and insulating qualities of certain special types of concrete wall construction for buildings of the dwelling-house type.

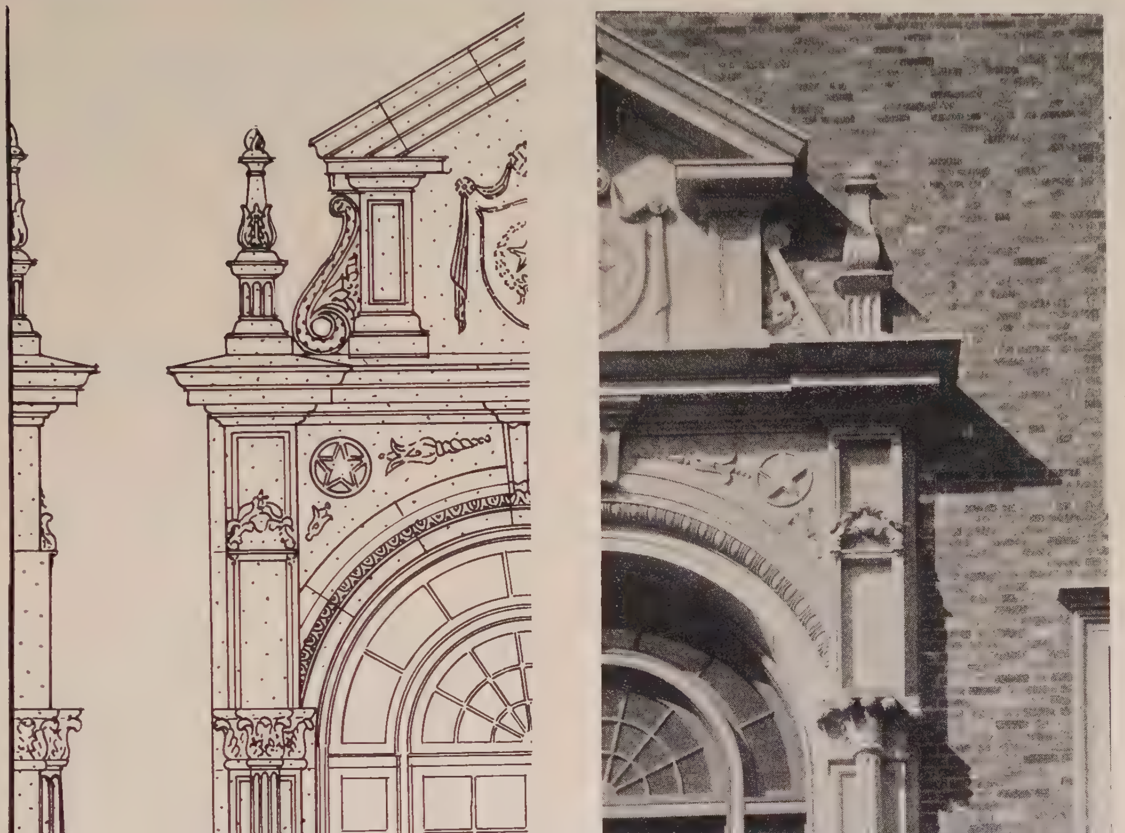
These tests have been undertaken in co-operation with the Portland Cement Association. The experiments are concerned with three types of wall—a single wall, a double wall with hollow spaces, and a ribbed wall.

St. Louis Modern Home Exposition

AT the request of the Federal Housing Administration, the Modern Home Exposition sponsored by the City of St. Louis will be held January 5 to 13 instead of November 10 to 18 as originally scheduled.

The St. Louis Modern Home Exposition, comprising 400 exhibits and a dozen "shows within a show," will be held in the Exhibition Hall of the new St. Louis Municipal Auditorium, constructed at a cost of $6,000,000.

Architectural Concrete



Detail of balcony window, Library Building, Houston, Texas, as executed in cast stone GLOVER & SONS, *Architects*

Platform Vibrator Aids Grout Penetration in Cement-Bound Macadam

Compaction of Slab Accomplished Without Rolling—Platform Moves Across Pavement Unaided—Permits Control of Slab Thickness

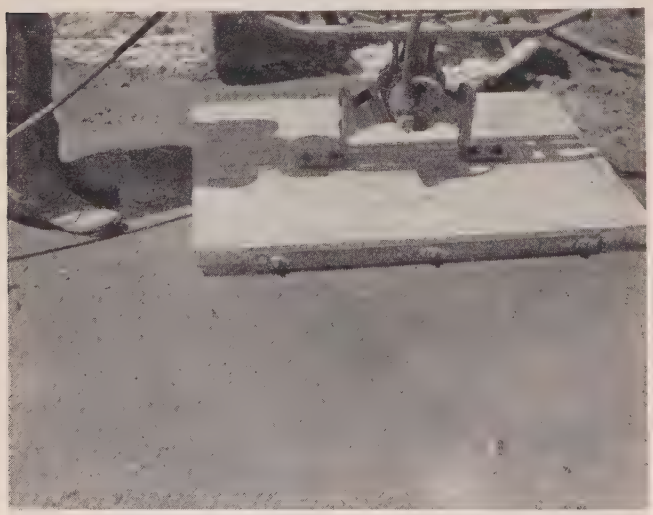
A HIGH-FREQUENCY vibrator, mounted on a 3 by 4-ft. wooden platform that moved back and forth as the position of the vibrator was changed, was one of the devices employed in compacting the cement-bound macadam in the experimental road built at Elmhurst, Ill., by the Portland Cement Association. Eight sections were compacted with this device.

Test Various Compacting Methods

Several different methods of compaction were employed on this experimental road. These included (1) rolling with a 5.8-ton tandem roller, (2) rolling with a 3.3-ton tandem roller, (3) tamping by hand, (4) vibrating with a heavy wooden screed on which three vibratory motors were mounted, and (5) vibrating with the platform vibrator mentioned above and shown in the illustration. In no case was more than one method of compaction applied in the same experimental section of road.

High-Frequency Vibration Found Effective

Both types of vibrators were found to be effective aids to penetration of grout, but only when the vibration was put into action at the time the grout was being deposited. Consolidation obtained by vibration was less than with the heavy roller, which means that more grout was required. The use of vibrators, on the other hand, resulted in a saving in coarse aggregate, because only a negligible amount of aggregate was pushed into the subgrade, whereas with the heavy roller a considerable amount of aggregate was wasted in this way.


Movable platform vibrator compacts cement-bound macadam and aids the penetration of grout

It is believed that if the aggregate had been rolled prior to the application of grout and the accompanying vibration, less grout would have been required.

As previously stated, the platform vibrator was used to compact eight of the experimental road sections. The aggregate had not been rolled, since one purpose of trying this method was to determine whether or not the rolling could be dispensed with. Aside from the probability that previous rolling would have reduced the quantity of grout required, the highly satisfactory results obtained without rolling indicate that the question of rolling may be made optional when the platform vibrator is employed. That is, if the contractor figures that the saving in grout is worth the cost of rolling, he will be justified in using a roller; but the fact remains that, without rolling, the platform vibrator produced strengths that were entirely satisfactory and were equal to the strengths obtained with the heavy roller (without vibration).

The platform vibrator, like the screed vibrator, was a definite aid to penetration of grout, although, as stated, it was necessary to operate the vibrator at the time the grout was deposited.

Controlling Depth of Finished Slab

Because of the fact that practically no coarse aggregate was pushed into the subgrade, the use of the platform vibrator without previous rolling permitted a close control of the depth of the finished slab. It is a fact that when rollers are used, rains occurring after the coarse aggregate is placed but before it is rolled often soften the subgrade to the extent that much of the material is pushed into the subgrade. In that event, additional stone must be spread to bring the finished slab surface to the required level. This, quite obviously, adds materially to the cost. It is a hazard that the contractor avoids when rolling is eliminated through use of the vibrator.

Operation of Platform Vibrator

One trip of the platform vibrator across the pavement left a smooth, even surface, with the coarse aggregate slightly exposed. Compaction operations were reduced to one trip of the platform vibrator during the placing of grout, and another trip across after free water was no longer being released from the grout. An interesting fact is that the action of the vibrator mounted on the platform causes the latter to move across the pavement unaided. The position of the vibrator unit determines the direction of the movement.

From a construction standpoint, it will be seen that the use of this platform vibrator has many advantages. It is light in weight, it is mobile, it is not an expensive piece of equipment, and its operating cost is low because the power consumption is moderate and it can be operated by two laborers.

A platform vibrator somewhat similar to the one here illustrated has been in use in France for some time, in the placing of cement-bound macadam pavements.

At left, general view of the Lyon & Billard Coal and Lumber Company yard, taken on the third day after fire broke out. Coal stored in a third silo back of the two shown is still burning. At right, burning coal being withdrawn from third silo, which remained undamaged after acting as shaft kiln for three days

Concrete Block Coal Silos Undamaged in Five-Day Fire

Block Walls Subjected to Intense Heat in Coal Yard Conflagration—Silos Act as Roaring Shaft Kilns

THE coal silos were still standing and in sound condition on the morning of August 10, when, after a 5-day vigilance, weary firemen quit the scene of a disastrous fire at Lyon & Billard Coal and Lumber Company's plant at Meriden, Conn.

Silos Transformed Into Furnaces

The blaze, which practically wiped out the rest of the yard, started on August 5 in a small building near one corner of the property. Aided by a high wind, the fire quickly spread across toward the concrete block silos on the other side, razing everything in its path. The coal-filled silos were soon transformed into roaring furnaces. So stubborn was the fire in the coal stored within the silos that tons of water had to be poured through the roof and against the outside of the silo walls before control was in sight. Firemen at the same time flushed burning coal out of the gates with hose streams.

By the third day two of the units were emptied of burning coal, but a third unit was still burning so actively that it could not be approached.

Only Minor Repairs Needed

Later inspection of all three silos, however, revealed that only minor repairs were needed to restore them to service. All three were structurally sound. In the case of the last silo to be extinguished, small cracks extended diagonally upward from the gates on the outside surface, caused probably by sudden chilling from the hose stream. On the inside no cracks were to be seen, in spite of a heat so intense that large areas of the concrete block surface had been melted. Repair work consisted of the replacement of only about 150 out of 10,000 block units.

This experience substantiates various tests made in the past on the fire-retarding and fire-resisting qualities of concrete masonry. For a number of years most designs of concrete block have been eligible for listing by Underwriters' Laboratories. Units meeting standard requirements may be listed as 3-hour fire retardants in 8-in. thicknesses.

Silo Units Are Solid Block Type

The Lyon & Billard silos were designed and built six years ago by the Nicholson Company, of New York. The concrete block are a special curved section (solid), grooved on four sides, dimensions 4½ by 9½ by 16 in. They were cast on the job with special steel pallets. The concrete for the blocks was mixed in the proportions of 1 part of cement, 1¾ parts of sand, and 2½ parts of traprock. The owner has chosen the same type of construction for a new shed and storage building.

Large Concrete Grain Storage Plant Being Built at Battle Creek

AS a mark of increasing production activity, the Kellogg Company, Battle Creek, Mich., announces the immediate construction of a huge new grain elevator with a capacity of approximately 1,000,000 bushels.

Increased business makes necessary increased grain storage capacity. The new elevator will double the company's present capacity and will provide several month's employment for some 250 steel and concrete workers, carpenters, mechanics and others.

This project was designed by the firm of Albert Kahn, Detroit. The construction contract has been awarded to John S. Metcalf Company, Chicago.

Reorganized Housing Division of PWA Begins Slum Clearance

Direct Use of PWA Money Begins to Show Results—Should Be Factor in 1935 Building Activities — Big Opportunity for Local Construction Groups

CONSIDERING the vast amount of well-organized effort now being centered on the Better Housing Campaign of the Federal Housing Administration, it is perhaps not surprising that sight has been lost of the opportunities for the construction industry in the low-cost housing and slum clearance activities of the Public Works Administration. After almost interminable delays and "reorganizations," this branch of public works construction may be an appreciable factor in 1935.

The use of PWA money to stimulate low-cost housing and slum clearance, it will be remembered, is specifically authorized in Title II of the National Industrial Recovery Act of 1933. To carry out this part of the national construction program, the Housing Division of the PWA was organized in the summer of 1933.

First Method Killed by Restrictions

The work of the Housing Division, as explained in an article by Ernest K. Lindley in the October 13th issue of *Today*, was divided into two classes. First was the lending of money to privately-owned limited dividend corporations. Unfortunately, the rules and restrictions set up by the PWA were so onerous that little inducement remained for private capital to invest in these limited dividend corporations. Before the impossible character of these restrictions became fully understood, Mr. Lindley relates, 533 applications for as many separate projects were filed; but later many of these were voluntarily withdrawn. Only 18 of the proposed projects reached the stage of tentative allotments, and only seven out of the original 533 received final authorization. These seven projects were allotted a total of $11,471,600, and their "percentage of completion" ranged all the way from zero to 100 per cent, as of September 14, 1934. Thus this first effort has amounted to little more than the proverbial "drop in the bucket."

Direct Use of PWA Money

The second and more important part of the PWA slum-clearance program is based upon the direct use of PWA money. The Federal Emergency Housing Corporation was created to expedite this direct slum-clearance work; but here again, many delays occurred. In June of this year Secretary Ickes, administrator of the PWA, ordered a complete reorganization of the Housing Division, which is now headed by Horatio B. Hackett, a man experienced in building. The division is well staffed by experienced architects, structural engineers and builders.

Dealing with Local Groups

In its direct slum-clearance work, Mr. Lindley continues, the Housing Division of the PWA now deals with municipal housing authorities or community-sponsored housing projects. The preliminary social and economic surveys are made locally. The Federal government acquires the site, either by purchase or condemnation. As a rule, the completed projects will be managed locally, and the investment of the Federal government may be repaid over periods ranging from 33 to 45 years.

The Construction Industry's Opportunity

Here is the opportunity for architects in particular, and for the construction industry in general. Every largely populated community contains men in the construction industry who have the confidence of the public and who are capable of assuming community leadership. Proper organization of a local construction industry and well-directed action on the part of its recognized leaders will arouse the necessary community interest and support, of the kind needed to make a slum-clearance project a success.

Actual Work Started in Atlanta

The Housing Division is now working with plans or projects in 35 cities. It has put aside approximately $150,000,000 for slum clearance. Title has been acquired to two sites in Atlanta, and the demolition of the slums that stood on these sites was begun on September 29. Title has been acquired for the site of a $3,000,000 project in Cleveland. Condemnation proceedings have been instituted in Chicago, in Indianapolis, and in Montgomery, Ala. The area involved in the first Chicago project covers 160 acres, and its cost is estimated at $12,500,000. Chicago and New York City have been allotted $25,000,000 each.

The Housing Division has prepared a series of model designs for different types of low-cost apartment houses on various kinds of sites. In almost every case, however, a local architect is employed to adapt the plan to local environment and the particular site.

FHA Home Plans

THE Portland Cement Association has begun publication of a new pictorial journal devoted to the reconstruction of homes with the aid of concrete. The move is part of the association's plan to participate in the Federal Housing Administration program. The uses of concrete are stressed in the dual before-and-after pictures shown. These pictures suggest many ideas to help home owners stage a national war against drabness and the ravages of wear and neglect. Included in the first edition is a statement instructing borrowers how to obtain Federal funds for the purpose.

Procedure Followed in Designing Concrete Mixtures

Appendix to Article in October Issue—Typical Sample Taken at Random—Procedure Explained from Beginning to End

By **JOHN C. SPRAGUE**
Inspector, U. S. Engineers, Huntington (W. Va.) District

This article has been written as an appendix to the paper entitled "Effect of Amount of Fine Aggregate on Quality of Concrete," published in the last issue of "Concrete," pages 16 to 19. It should, therefore, be regarded as a part of the previous article.—The Author.

TECHNICAL data pertinent to the discussion in the previous installment in the October issue of CONCRETE has been relegated to this position so that those interested only in the results obtained will not be bothered with details. The general method followed in making the tests has already been discussed, so that it remains only necessary to sketch briefly the procedure followed in designing the mixtures and computing the quantities for the sample. A typical sample will be taken at random and the procedure explained from beginning to end.

Materials Tested Repeatedly

Before going into the design, however, a word will be said concerning the preliminary tests. All constituent materials were tested for physical characteristics such as specific gravity, unit weight, void content, grading of aggregate, etc., etc. These tests were made, of course, in accordance with the specifications of the American Society for Testing Materials. In order to insure the most accurate results possible, the physical characteristics of the aggregates were determined as accurately as possible by making repeated tests for their voids, specific gravities, and unit weights (compacted) and then utilizing the equation[5]—

$$V \times 62.4 \times S = (62.4 \times S) - W$$

Where V = voids in the material.
S = specific gravity of the material.
W = unit weight of the material.

By using this equation it was possible to check the field determinations and see whether or not the values took their proper position in their inter-relationship; thus it is patent that there is no danger of having a void determination inconsistent with the unit weight or specific gravity of the material, and vice versa.

As a typical example we will review the procedure used in determining the amounts of the constituents for a mix using 30 per cent sand to total aggregate in which the maximum size of the coarse aggregate is 2 in., graded down to No. 4.

Constant Cement Factor Used

As shown at the top of Table 1, on page 18 of the October issue of CONCRETE, the cement factor for all mixes in which the large gravel was used was specified as 1.25; therefore if a cu. yd. of concrete contains five bags of cement, one bag of cement must produce 27/5 of a cu. ft., or 5.4 cu. ft. By the same line of reasoning, if 1 cu. yd. of concrete using ½-in. gravel contains 6 bags of cement, as indicated by Table 2, one bag must produce 4.5 cu. ft. of concrete.[6] Since 0.45 is a common factor of both these figures, and a convenient quantity to work with, it was decided on as the unit of volume for use in the tests. Thus, 0.45 cu. ft. = 1/12 of 5.4 cu. ft. Therefore, 1/12 bag mix produces 0.45 cu. ft. concrete.

1/12 Bag Mix

Cement:	0.0403 cu. ft. absolute volume
Admixture	0.0034 cu. ft. absolute volume
Sand:	0.1025 cu. ft. absolute volume
Gravel:	0.2392 cu. ft. absolute volume
Water:	0.0646 cu. ft. absolute volume
Concrete:	0.4500 cu. ft. absolute volume

$0.45 - (0.0403 + 0.0034 + 0.0646) = 0.3417$

$0.3417 \times 0.30 = 0.1025$ $\quad 0.3417 \times 0.70 = 0.2392$

$0.1025 + 0.2392 = 0.3417$ cu. ft. absolute volume of aggregate.

Quantities for 0.45 Cu. Ft. Batch

Cement:	$0.0403 \times 3.11 \times 62.4 =$	7.835 lb.
Admixture:	$0.0034 \times 3.11 \times 62.4 =$	0.665 lb.
Sand:	$0.1025 \times 2.60 \times 62.4 =$	16.630 lb.
Gravel:	$0.2392 \times 2.60 \times 62.4 =$	38.080 lb.
Water:	$0.0646 \times 1.00 \times 62.4 =$	4.031 lb.
Total		67.969 lb.

After the above ingredients had been mixed, as explained in the discussion, the concrete was placed in the measure and weighed as a check on the accuracy of the individual weights of various materials. In this case the weight of the total concrete was 67.81 lb.—a loss of 0.159 lb., or about 2½ oz. This loss is negligible and need not be explained, as the causes are obvious.

The water-cement ratios were determined by a cut-and-try method in order to find what amount of water was required to give the required 3-in. slump. The tests made to determine the water-cement ratios were made prior to these and have no direct relationship.

Construction of Chart

The chart, shown as Figure 1 on page 17 of the October issue of CONCRETE, represents a block of concrete having a volume of 0.45 cu. ft., and its full volume is represented by 100 per cent. The percentage of the whole of the variout constituent materials was computed as follows:

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[5] Sprague, J. C.; "Basic Steps in Control of Concrete," CONCRETE, May, 1934.

[6] Throughout this article, the references to Table 1 and Table 2 pertain to the tables appearing on page 18 of the October (1934) issue of CONCRETE. Likewise, references to Figure 1 signify the chart on page 17 of the same issue.

Per cent

Percentage of gravel to total volume $= \frac{0.2392}{0.45} = 53.2$

Percentage of gravel plus sand, to total volume $= \frac{0.3417}{0.45} = 76.0$

Percentage of gravel plus sand plus cement, to total volume $= \frac{0.3820}{0.45} = 85.0$

Percentage of gravel plus sand plus cement plus admixture, to total volume $= \frac{0.3854}{0.45} = 85.6$

Percentage of gravel plus sand plus cement plus admixture plus combined water $= \frac{0.4136}{0.45} = 92.0$

Percentage of gravel plus sand plus cement plus admixture plus combined water* plus uncombined water $= \frac{0.45}{0.45} = 100.0$

By referring to Figure 1 it will be seen that the curves were plotted from the above percentages for 30 per cent sand and other percentages for other ratios of sand to total aggregate.

The weight of the concrete sample as shown was 67.969 lb. for 0.45 cu. ft. Therefore, the weight of the concrete was $67.969/0.45 = 151.0$ lb./cu. ft.

For concrete density two values are given for each sample. That is, that density which takes cognizance of the water which combines chemically with the cement and which determines the density curve in Figure 1, and that density which considers only the original solids in the mixture.

Calculation of Water-Cement Ratio

The nominal water-cement ratio is used in determining the concrete density. The effective water-cement ratio is shown simply to indicate what strength might be expected in compression for the different mixtures. The effective *w/c* ratio is calculated from the nominal ratio as follows:

Total factor = 1.356 (5 bags + 40 lb. cement per cu. yd)
Cement factor = 1.25 (5 bags per cu. yd.)
Nominal *w/c* ratio = 0.775

Therefore, effective *w/c* ratio $= \frac{5 \times 0.775}{5.42} = 0.714$

1. Assuming that 1 bag of cement requires 2 1/3 gal. of water to hydrate it and that the resulting new material is a solid—
Then density $= 0.4136/0.45 = 92$ per cent
2. Assuming that the only solids in the concrete are those originally introduced—
Then density $= 0.3854/0.45 = 85.6$ per cent

The increase in volume of the mixtures containing an excess amount of sand is shown graphically by curve *A*, Figure 1, which was plotted by dividing the actual volumes shown in the tables by the theoretical volume of 0.45 cu. ft. and the resulting percentage plotted as points to determine the curve. For instance, taking the sample which contained 40 per cent sand we find that the actual volume of the sample was 0.457 cu. ft. This means that the theoretical volume of 0.45 cu. ft. was expanded to 0.457 cu. ft. by the use of excess sand. The ratio this new volume holds to the unit volume, therefore, becomes 0.457 divided by 0.45, or 101.5 per cent. This point, and others, were plotted and connected by the curve.

---

*2 1/3 gallons of water (more or less) hydrate 1 cu ft. of cement. Therefore, $\frac{2.33/7.5}{12} + \frac{2.33/7.5}{140} = 0.0282$ cu. ft. of combined water.

Testing Penetration of Grout in Cement-Bound Macadam

Holes Dug Into Stone to Subgrade Disclose Extent of Penetration

A CONVENIENT way to test the completeness of the penetration of grout in cement-bound macadam construction is shown in the accompanying illustration.

Proof of complete penetration of grout in cement-bound macadam construction

After the stone is rolled and placing of grout has been started, the holes are dug by removing the stone for the full depth, down to the subgrade. As the newly-placed grout approaches the hole, the observer should be careful to see whether the oncoming grout first enters the hole at the bottom. If so, the penetration is known to be complete, since it proves that the grout is spreading out directly on the subgrade.

The method here illustrated was employed in placing the cement-bound macadam runway in the C. & O. Railway shops at Huntington, W. Va., described on pages 3 and 4 of the September (1934) issue of CONCRETE.

FHA Advertising Proof Sheets

TEN advertising proof sheets, designed in part for local newspaper advertising by manufacturers and producers of building materials, and by contractors, have been prepared by the Federal Housing Administration for distribution to interested companies and individuals.

Concrete contractors and products manufacturers who contemplate local newspaper advertising can obtain many useful helps from these proof sheets, sets of which may be obtained from the Director of Public Relations, Federal Housing Administration, New Post Office Building, 12th Street and Pennsylvania Avenue, Washington, D. C.

Concrete Boathouse Replaces Plant Destroyed by Fire

Palmer Boat Company Takes No Further Chances with Burnable Construction—Incombustible Material Used Throughout

By FRED C. SIMMONDS
Fontana, Wisconsin

EARLY last June, just as the boating season was getting under way in Wisconsin, a large wood-frame boathouse belonging to the Palmer Boat Company and located at the east end of Lake Geneva in the town of Fontana was completely destroyed by fire.

The building had been used for the storage and painting of sail boats and speed boats. The Palmer Boat Company is owned by J. Donald Campbell and H. F. Jaeger, manufacturers of sail boats and other pleasure craft, of Delavan, Wis.

New concrete boathouse of the Palmer Boat Company replaces the wooden building destroyed by fire in June

A new building was urgently needed; but Mr. Campbell and Mr. Jaeger were determined to take no further chances with fire. In consequence, they had plans drawn up for a large new building, 75 by 225 ft. in plan, with walls of cinder concrete masonry units, reinforced concrete floor construction, and with incombustible roof construction of gypsum slabs (pyrofill) supported on steel trusses and purlins. The windows have steel sash. The concrete masonry units in the foundation and superstructure walls are of "cincrete," in which the aggregate is a specially treated cinder aggregate produced by the Cincrete Corporation, of Milwaukee.

The foundation walls are 12 in. thick, built of 12-in. "cincrete" units. The superstructure wall on the principal front of the building is also 12 in. thick, built of a 4-in. facing of clay brick, with headers, and with 8-in. "cincrete" block back-up. The end walls, the rear wall and two fire-walls are built 10-in. thick, with 10-in. "cincrete" units. The floor construction is of reinforced concrete construction.

From this it will be seen that 8-in., 10-in. and 12-in. concrete units were used in various parts of the walls, and that three sides of the superstructure have the concrete units exposed. It will be seen, further, that no burnable material was used in the new building. Concrete and concrete units are the principal construction material depended upon, not only because of their fireproof qualities, but because of the special location. Since the building is in direct contact with water, and exposed to the consequent dampness, concrete and concrete products were regarded as the ideal construction materials.

Acknowledgments: The concrete building units, as stated, are made of portland cement and "cincrete," produced by the Cincrete Corporation, of Milwaukee. The general contract was held by Pihl & Son, of Williams Bay, Wis., and the masonry contract was awarded to Henry Dreesman, of Burlington, Wis. Through co-operation and teamwork, a high rate of speed was maintained, and the new building was completed in time to be put into service before the boating season was closed.

Expenditures for Property Rehabilitation Doubled

REHABILITATION and improvement of neglected property of all kinds is growing into a national program, according to a statement made recently by Thomas S. Holden, vice-president of F. W. Dodge Corporation. Contracts for alterations and additions to all classes of structures have doubled in volume this year as compared with last year. In the 37 eastern states the amount of such work recorded in the first 9 months of this year was $277,878,300, compared with $139,418,000 for the corresponding period of 1933. A little over half of this year's modernization expenditures were made on privately-owned commercial, industrial and residential buildings. The largest single item in this year's record was $56,213,800 for commercial building improvements, a 69 per cent increase for this class of work over the corresponding period of last year; alterations and improvements for residential structures amounted to $45,977,100, a 36 per cent increase over last year. These figures do not include small repair jobs, or many jobs resulting from loans made under the new Federal Housing Administration plan.

Co-operative Contracting Simplifies Landing of Renovating Jobs

A GENERAL contractor who is qualified to give an accurate estimate and prepared to deliver a thorough-going modernization job complete in all its details has a distinct advantage over the independent carpenter, mason or plumber in landing his contract.

In consequence, in cities where the Better Housing movement is now beginning to operate, these independents together with the painting, electrical, sheet metal and other contractors are banding together and forming general contracting companies on a partnership basis. Early reports indicate that this united action is producing gratifying results.

There are a number of indisputable arguments in favor of the one flat, all-inclusive estimate on the cost and the subsequent delivery in "capsule form" of a first class renovation job, as against separate negotiations.

Members of these co-operatives continue to function as leaders in the trades with which they are directly connected. They make their inspection of the properties to be repaired and improved, then prepare their bids. Instead of submitting these estimates to the property owners, they turn them in to the agent of the co-operatives. If the modernization job calls for the employment of a painter, steam fitter and plumber, carpenter, mason, electrician, roofer, sheet metal worker and plasterer, all submit their bids to the co-operatives. When the contract is obtained and the work completed they collect their share of the total.

The property owner likewise shares in the advantages offered by such a set-up. He knows precisely what the full job is going to cost him at the outset and deals with one instead of a group of contractors. Masons, carpenters, plumbers, etc., being members of the organization, know just when the job will be ready for their workmen and lost time is avoided. Nor does the individual lose time in attending to the financial aspects of the matter, since this can be handled by the secretary of the co-operative.

The outstanding benefit to be found in such an arrangement, however, is that it simplifies and puts on a practical basis the solicitation of new business for the building trades.

Property owners are busy men and many of them at this particular time have their own business worries. Field workers of the Federal Housing Administration and local modernization committees report that one of the most difficult parts of their task is to get owners to make a thorough inspection of their dwellings or business places for possible needed repairs.

If such properties are urgently in need of modernization; if such improvements would require the attention of plumber, carpenter, painter, sheet metal man, etc., separate calls by business-getters in the employ of these various contractors might, by taxing the owner's patience, ruin the chances of getting any contract whatever.

Before any contractor takes the field in the hunt for new business he should thoroughly inform himself of the provisions of the easily understood National Housing Act and thoroughly digest the simple rules and regulations as laid down by the Federal Housing Administration. He should be prepared to answer any question the property owner may ask regarding procedure required in the application for a loan under the modernization credit plan. This information will be found in condensed form in the September (1934) issue of CONCRETE, page 15.

If the construction groups will push modernization aggressively, now that thousands of banks are lending their full co-operation, many thousands of property owners can indubitably be brought into line without difficulty. Loans, less than eight weeks after the launching of the Better Housing campaign, are being made at the rate of more than a million dollars a day and the "cash from savings" being spent in this same cause is perhaps double that amount. This means that more than one billion dollars of new cash business will be offered the building trades within the next twelve months.

Preview of Concrete Mosaic Ceilings in Department of Justice

Washington Architects and Engineers Hear Explanation of Colored Architectural Concrete

A PREVIEW of the largest mosaic ceilings in the United States, covering 11,000 sq. ft., in the entries to the Great Court of the new Department of Justice Building, Ninth Street and Pennsylvania Avenue, Washington, D. C., was held Wednesday afternoon, October 24. The monumental court of this building is the largest court in the United States.

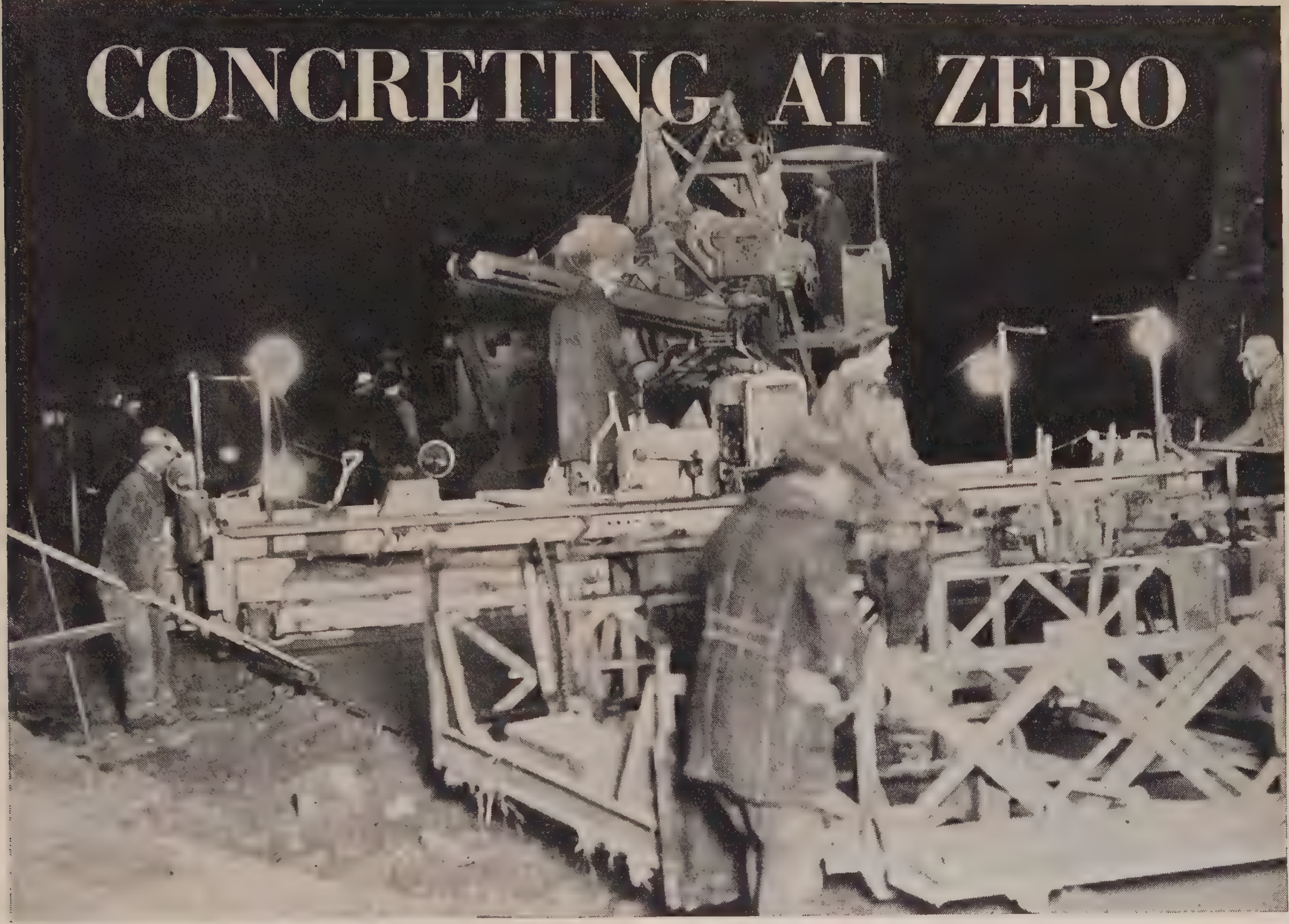
These are the first mosaic ceilings that have ever been made integral with the structure of a building. They are also the first mosaic ceilings to be precast in architectural concrete, and the only mosaics of their kind to be made entirely of domestic materials.

In designing the Department of Justice Building, Zantzinger, Borie and Medary, the architects, used these ceilings as the only touch of color to be employed in the exterior composition of the entire triangle of $100,000,000 worth of Government buildings.

Invitations to the preview were issued by the Washington, D. C., chapter of the American Institute of Architects. The guests included leading Washington engineers.

John J. Earley, whose Washington studio produced the mosaics, was present to explain how the ceilings were made and assembled. Samples of the materials used in the construction of the mosaics were exhibited.

CONCRETING AT ZERO



Summer job progress in Winter
Heat-curing costs reduced

Concrete temperatures are the controlling factor in Winter work; air temperatures only affect heat and protection requirements. Results depend upon how effectively curing temperatures are maintained, and upon the time required for cement to provide service strength. *The quicker concrete hardens, the less time and expense required for heat protection.*

Winter Advantages of 'Incor'

Through a basic process improvement, 'Incor' Cement cures or hardens 5 times as fast as ordinary Portland cement. Result, heat protection costs 60 to 70% lower, cold-wave hazard minimized, Summer schedules possible even in dead of Winter.

These advantages are particularly important in highway construction. Bridge building can be carried on throughout the Winter. 'Incor' also lengthens the paving season, making it possible to close gaps and complete highway sections which might otherwise lay over until Spring. Traffic isn't forced to use open sub-grade, contractors receive substantial estimates.

Resurfacing a 1½-mile section of Hamilton-Eaton Road in Southwestern Ohio, illustrates these advantages:

First concrete poured December 5th, last December 30th. Finished grading carried 500 ft. ahead of mixer, subgrade straw-covered at night, thawed out in morning with hot water and steam. Water heated by boiler mounted on skids, drawn along by mixer. Concrete placed on grade at 70°, covered with wet burlap and 10″ of straw, protected until 600 lb. beam-strength permitted opening.

Beams and cylinders, cured with pavement, averaged 72-hour opening strengths. December 26th night temperatures dropped to 7° below zero; next morning temperature under covering was 44°. *Cores of 'Incor' concrete cut from that day's run, developed 24-hour compressive strength 1509 lbs., 48-hour 2610 lbs.*

In severe winter weather, 'Incor' concrete was ready for service sooner than with ordinary cement in Summer.

Write for 'Winter' Book

A new, illustrated book on Winter construction is now ready. For free copy, address 'Incor' 24-Hour Cement, Room 2200, 342 Madison Ave., New York. 'Incor'* is made and sold by producers of Lone Star Cement, subsidiaries of International Cement Corporation, New York; also sold by other leading cement manufacturers.

*Reg. U. S. Pat. Off.

'INCOR' 24-Hour Cement

◆ CODE NEWS FOR THE INDUSTRY ◆

Code Assessments for Mason Contractors

THE code authority for the mason contractors industry has made application to the National Industrial Recovery Board for further approval of its budget for the expense of administering the code for an additional consecutive three months period ending December 31, 1934. The total amount for the period is $150,000. The basis of contribution is as follows:

There shall be no assessments on contracts less than $100 in value.

All contracts more than $100 but not more than $500 shall be assessed $1.00 each.

Contracts more than $500 but less than $1,000 shall be assessed $2.00 each.

All contracts of $1,000 or more shall be assessed at the rate of $2.50 per $1,000, or fraction, of contract value.

Copies of the budget are available upon request at the office of the National Recovery Administration, Room 624, Albee Bldg., 15th and G Streets, N.W., Washington.

Concrete Pipe Manufacturers' Exemption Terminated

C. E. ADAMS, Division Administrator, has issued an order terminating paragraph 3 of administrative order 36-X, dated May 26, 1934, in so far as it affected the concrete pipe manufacturing industry. Order 36-X had the effect of permitting manufacturers of concrete pipe whose principal line was in some other industry to avoid paying dues toward the cost of administering the concrete pipe code. This exemption has now been terminated, so that all concerns who manufacture pipe must contribute a proportionate share toward the costs of administration.

Chairman of Mason Contractors' Competition Board

EMIL DIEBITSCH, president of the Mason Builders Association, 315 Fifth Avenue, New York City, has been appointed by the National Industrial Recovery Board as impartial chairman of the board to investigate complaints of unfair competition in the mason contractors' division of the construction industry. This division has submitted, for approval, a budget totaling $150,000.

Concrete Floor Treatments Exemption Terminated

REFERENCE is made in the October issue of CONCRETE, page 14, to the fight won by the ready-mixed concrete industry over exemptions in the matter of paying dues, granted to material dealers and others who produce ready-mixed concrete, but whose principal line of business is in some other industry.

A similar situation has existed in the industry covering waterproofing, dampproofing, caulking compounds, and concrete floor treatments. As in the case of ready-mixed concrete, the exemption granted in administrative order X-36, dated May 26, 1934, has now been terminated, and all producers of these products are required to pay their share of the costs of administering this code.

Concrete Mixer Manufacturers' Code Authority

THE National Industrial Recovery Board has approved the following as members of the code authority for the concrete mixer manufacturing industry: A. A. Levison, Pittsburgh, Pa.; L. S. Holden, Waterloo, Iowa; Walter Muller, Dunellen, N. J.; B. F. Devine, Milwaukee, Wis.; and Lion Gardiner, Columbus, Ohio.

Addresses of Code Authorities

FOLLOWING are the addresses of the code authorities of industries and branches of industries related or of interest to the concrete construction industry. When writing to a code authority, include the words "code authority" in the address, thus: Code Authority, Construction Industry, National Press Building, Washington, D. C.

Builders' Supplies Trade
Room 1907—Investment Building
Pittsburgh, Penna.

Cement-Gun Contractors Industry
5550 Bartlett Street
Pittsburgh, Penna.

Cement Manufacturing Industry
111 W. Washington St.
New York, N. Y.

Concrete Burial Vault Industry
(Chairman of Code Committee is L. A. Chick, care of Blairsville Concrete Products Co.
100 North East Lane, Blairsville, Penna.)

Concrete Masonry Industry
211 Edgemont Place
Teaneck, N. J.

Concrete Mixer Manufacturing Industry
221 W. Madison St.
Chicago, Ill.

Concrete Pipe Industry
33 W. Grand Avenue
Chicago, Ill.

Construction Industry
National Press Building
Washington, D. C.

Construction Machinery Distributors Trade
207 W. Pearl Street
New York, N. Y.

Crushed Stone, Sand and Gravel, and Slag Industry
Munsey Building
Washington, D. C.

General Contractors' Industry
222 Munsey Building
Washington. D. C.

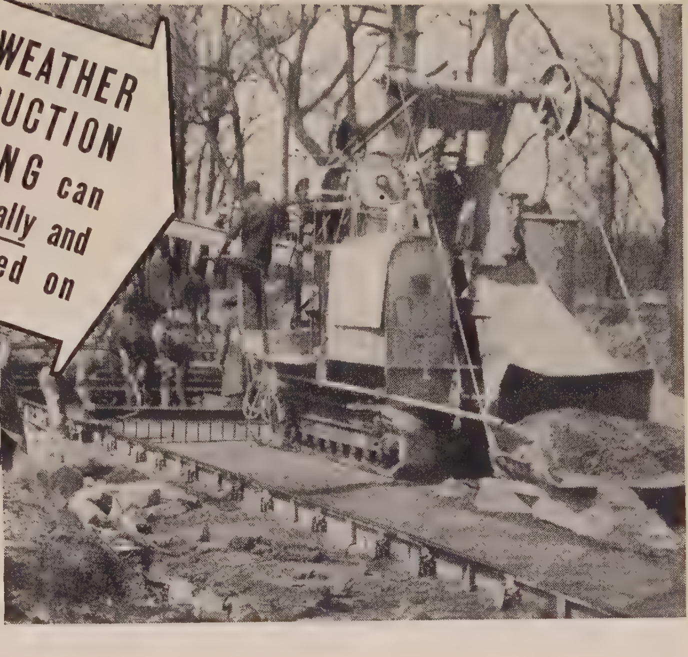
Ready-Mixed Concrete Industry
951 Munsey Building
Washington, D. C.

Reinforcing Materials Fabricating Industry
201 North Wells Street
Chicago, Ill.

Road Machinery Industry
410 No. Michigan Avenue
Chicago, Ill.

Waterproofing, Dampproofing, Caulking Compounds and Concrete Floor Treatments Industry
11 West 42nd Street
New York, N. Y.

BETTER WINTER CONCRETE



COLD WEATHER CONSTRUCTION and PAVING can be economically and safely carried on

WINTER concreting is now entirely practical. Concrete placed and cured at a temperature of 40° F., attains *a strength of* 2000 *lbs. per square inch in five days* when two pounds of Calcium Chloride per sack of cement is incorporated in the mix.

As shown by the chart, Calcium Chloride shortens by ONE-HALF the time required to gain 2000-pound strength with plain concrete.

These results are confirmed by the statement of the Bureau of Standards in a report presented to the Highway Research Board: "Concretes with all percentages of Calcium Chloride (0% to 3%) show increased strength over plain concrete at all ages tested."

This accelerated development of early-strength concrete reduces the time during which special protection is required when concrete is placed below freezing temperatures. The use of Calcium Chloride thus makes winter concreting entirely—*and economically*—practicable. It insures *proper curing* as well.

Thus does Calcium Chloride concrete curing help to keep labor employed and contractors' equipment in use the year round. For complete, free information on cold-weather concreting, write to any of the following members of the

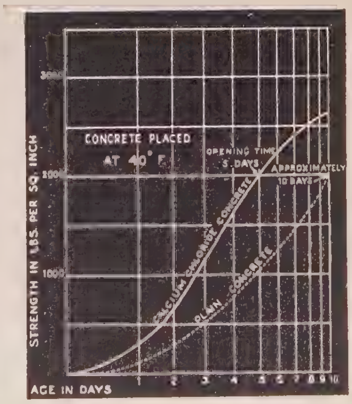
CALCIUM CHLORIDE ASSOCIATION

THE COLUMBIA ALKALI CORP.
Barberton, Ohio

SOLVAY SALES CORPORATION
61 Broadway, New York City

THE DOW CHEMICAL COMPANY
Midland, Michigan

MICHIGAN ALKALI COMPANY
60 E. 42nd St., New York City



CALCIUM CHLORIDE

FOR MODERN CONCRETE CURING

Home Renovation Drive Starts

AS the summer season gives way to the autumn, the most interesting development in the building industry is to be found in the activities of the Federal Housing Administration. The first public report regarding actual operations made by Administrator Moffett on September 21 states that 4,412 loans calling for $2,026,000 have been reported, though this does not necessarily include all loans made. This sum may be considered substantial for the first two weeks of operation. It equals a monthly rate of $4,000,000, which compares with residential building contracts of $18,600,000 in August. The loans average $450. The total amount of activity resulting from this renovation drive will depend on the strictness of the requirements to be met by borrowers, but the possibilities are big if all branches of the building trade will co-operate in appealing to the pride of home-owners (particularly the women) in their establishments. —*The Brookmire Lumber and Building Bulletin of September* 25, 1934.

Coming Conventions

***November 12-15*—American Association of State Highway Officals. Annual. Santa Fe, New Mexico.**

***December 6-7*—Highway Research Board, National Research Council. Fourteenth Annual Meeting. Roy W. Crum, Director, 2100 Constitution Avenue, Washington, D. C.**

1935

***January 5-13*—St. Louis Modern Home Exposition. Exhibition Hall. St. Louis Municipal Auditorium. Lincoln G. Dickey, Director.**

***January 22-25*—American Road Builders' Association. Convention and Highway Exhibit. Willard Hotel, Washington, D. C. Chas. Upham, Engineer-Director, National Press Building, Washington, D. C.**

***February 19-21*—American Concrete Institute. Thirty-First Annual Convention. Roosevelt Hotel, New York City. Harvey Whipple, Secretary, 7400 Second Blvd., Detroit, Mich.**

Pure Silica Admixture Improves Quality of Concrete

Increased Plasticity and Flowability Are Among Qualities Claimed—Product Is Ground to Extreme Fineness

A PURE white silica, said to be strictly inert, having a highly colloidal and absorptive nature and showing practically no expansion or contraction, has been put on the market as a concrete admixture under the trade name of "Opalite Admix," by Corona Products, Inc., Rogers, Ark.

The silica is obtained from a deposit of decomposed chert located near Rogers, where the company has a mill for grinding and preparing the product. While the deposit is of chalk-like softness, and is easily broken or cut, examination under the microscope discloses it to be made up of minute particles of amorphous silica. About 2,500,000 tons of the deposit have been blocked out, although the total deposit in this location is estimated at 10,000,000 tons.

Tests by the Robert W. Hunt Company, of Chicago have disclosed the chemical constituents of this product to be:

	Per cent
Silica (SiO_2)	99.50
Iron oxide (Fe_2O_3)	0.045
Aluminum oxide (Al_2O_3)	0.10
Calcium oxide (CaO)	0.005
Magnesium oxide (MgO)	0.10
Loss by ignition	0.25
	100.00

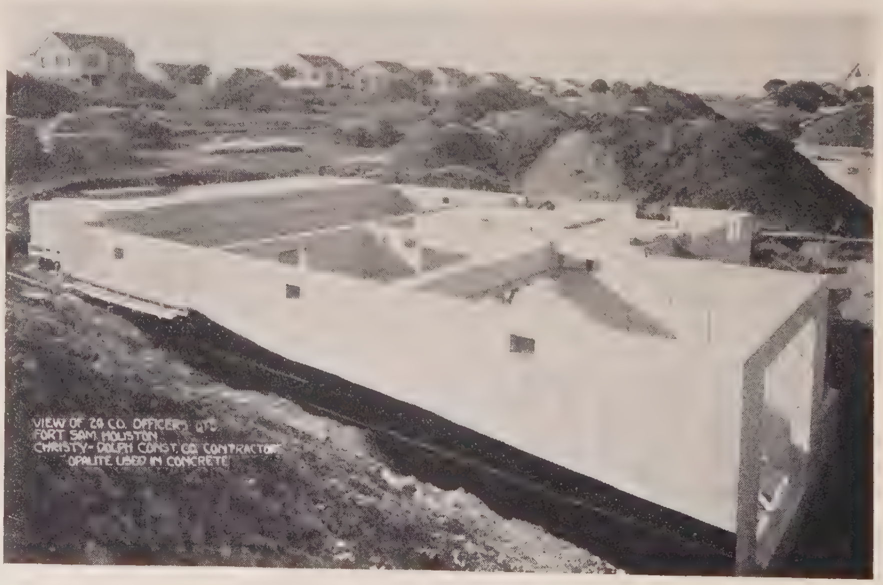
Absorption of water is 32 per cent, by weight; absorption of mineral oil is 41 per cent; and that of vegetable oil, 34 per cent.

It is claimed by the producer that this highly siliceous admixture, in addition to its inert and colloidal nature, has unusual lubricating qualities. This latter quality, it is asserted, increases the plasticity and flowability of concrete, thus eliminating honeycombing without necessitating a change in the water-cement ratio. The yield is increased by 4 per cent, it is claimed.

The producer grinds this material to such fineness that it passes the 400-mesh sieve. Because of this fineness, and its colloidal nature, it is said to coat thoroughly the particles of aggregate in concrete. Again, because of its highly absorptive qualities, it retains within the concrete a sufficient quantity of water to permit complete hydration of the cement. It crystallizes the free lime liberated during the hardening of concrete, rendering it insoluble. It gives to concrete the property of high early strength, causing it to attain a normal 21-day strength in 7 days, with a greatly increased ultimate strength, the producer asserts.

Recent construction projects in which "Opalite Admix" was used include the city water reservoir at Beaumont, Tex., and a number of officers' quarters at Fort Sam Houston, Tex.

This product is put up in 50-lb., 80-lb. and 100-lb. bags. The producer ordinarily recommends the use of 4 lb. to the bag of cement.


VIEW OF 24 CO. OFFICERS QTS.
FORT SAM HOUSTON
CHRISTY-DOLPH CONST. CO. CONTRACTOR
OPALITE USED IN CONCRETE

Type of finish obtained with "Opalite" admixture in foundation walls for officers' quarters, Fort Sam Houston, Tex.

BOOKS On Concrete

List No. 2—Design and Construction, Concrete Making, Cement Manufacture

(Prices quoted are for cash in advance, and include postage)

DESIGN AND CONSTRUCTION OF FORM WORK FOR CONCRETE STRUCTURES. By A. E. Wynn. 320 pages, 219 ills., 12 folded inserts and 11 design tables. Cloth bound, stamped title in gold. Price **$6.00**

"Wynn's Book" is a phrase commonly known to engineers, designers, and foremen, and is heard wherever concrete construction is under way. This book covers every phase of forms for concrete construction, and is fully supplemented with many illustrations, tables and drawings and printed on a superior grade of enameled paper.

CONCRETE CONSTRUCTION MADE EASY. By Leslie Turner and Albert Lakeman. 113 pages, 65 illustrations, 16 tables. Cloth bound. Price **$2.00**

A practical book that solves problems in the design and erection of any type of concrete structure. Full designs with tables and all necessary information for building of foundations, walls, columns, floors, roofs, staircases, beams, water tanks, retaining walls, lintels, formwork, saw-tooth roofs, etc. Written clearly and plainly.

BASIC PRINCIPLES OF CONCRETE MAKING. By Franklin R. McMillan, Director of Research, Portland Cement Association. Ninety-nine pages, 6x9½, 32 illustrations and tables. Price **$2.00**

The author has culled the essentials out of a mass of scientific data on this subject and presents them with force and directness in this book. He shows the effects of quality of material, of proportioning, mixing, working and curing on the finished concrete.

The importance of variable mixes; tests for permeability; how to obtain strength, durability and watertightness; effective ratios; importance of proper construction methods—these and many other vital topics are discussed fully and **authoritatively.**

GENERAL ENGINEERING HANDBOOK. By Charles Edward O'Rourke and 29 associates. Flexible cover; 921 pages, 5 by 8 in., numerous tables, diagrams, and illustrations. Price **$4.00**

A great amount of fundamental engineering data in usable form, 31 separate sections dealing with as many specific branches of engineering. Of particular interest to engineers who specialize in the use of concrete as a structural material are sections devoted to "Highways," by Thomas R. Agg; "Reinforced Concrete Structures," and "Stresses in Framed Structures," by Charles Edward O'Rourke; "Engineering Materials," by Herbert H. Scofield; "Foundations," by Roland P. Davis; and "Mechanics," by Alfred P. Poorman.

REINFORCED CONCRETE CONSTRUCTION. By George A. Hool, Professor of Structural Engineering, University of Wisconsin.

Vol. I—Fundamental Principles. Third Edition. 380 pages, 6x9, 139 illustrations, 18 tables, 28 diagrams **$3.50**

Vol. II—Retaining Walls and Buildings. Second Edition. 700 pages, 6x9, illustrated **$6.00**

Vol. III—Bridges and Culverts, 688 pages, 6x9, over 600 illustrations, 41 plates **$6.00**

ESTIMATING AND COST KEEPING FOR CONCRETE STRUCTURES. By A. E. Wynn. Published in 1930; 272 pages, 92 illustrations, 2 folders. Price **$5.00**

The author of this book has had a wide experience in contracting for all kinds of concrete structures, and in this volume he publishes his own simple methods of estimating, cost-keeping and book-keeping. Reproductions are given of all blank forms required.

CONCRETE ENGINEERS' HANDBOOK. By George A. Hool and Nathan C. Johnson, assisted by S. C. Hollister, and with chapters by Harvey Whipple, Adelbert P. Mills, Walter S. Edge, A. G. Hillberg and Leslie H. Allen. 800 pages, 6 x 9. Illus. Flexible binding. Price **$6.00**

A compact reference book, containing tables, formulae and data on plain and reinforced concrete, covering the entire field.

CEMENT CHEMISTRY IN THEORY AND PRACTICE. By Prof. Dr. Hans Kuhl, Director of the Institute for Cement Research, Berlin. Translated into English by J. W. Christelow, B.Sc. 64 pages, 6 by 9, cloth cover. Illustrated with a number of halftones and diagrams. Price **$2.50**

An authoritative book on the chemistry of cement, a translation of a series of lectures delivered by Dr. Kuhl in Moscow, at the special request of the **Soviet government.** The author presents the most up-to-date knowledge of the subject in simple language. The result is a concise record of modern research on the manufacture and setting of cement. Chapter headings are: (1.) The Development of Cement Research; (2.) The Theory of Cement Burning; (3.) The Constitution of Portland Cement Clinker; (4.) The Problem of Hardening and Its Significance in Cement Research; (5) The Chemistry of High-Strength Cements; and (6.) The Technical Aspect of High-Strength Cements.

PORTLAND CEMENT. By A. C. Davis, works managing director, Associated Portland Cement Manufacturers, Ltd. Published in 1934. Cloth, 435 pages, 6½ by 9½ in., 262 illustrations, 22 tables. Price **$7.50**

A new book on cement manufacture, covering more especially the present-day British and continental practices. The author discusses and analyzes such important problems as modern manufacturing methods and organization; formation and nature of cement raw materials; factors governing choice of materials and manufacturing processes; advantages of dry and wet processes; raw material and clinker-grinding problems; improving the efficiency of the rotary kiln; methods of coal feed, slurry drying, and kiln control; reactions in burning cement; rotary kiln heat balances; conservation of heat in rotary kilns; advantages of the purchase of electricitv compared with generation at the factory; modern methods of packing and shipping cement; production costs; mineralogy and chemistry of cement.

STANDARD CONSTRUCTION METHODS. By G. Underwood. 408 pages, 330 illustrations. Price **$5.00**

A complete, detailed presentation of actual methods used in practical construction work. A book packed from cover to cover with plans, short-cuts and expedients for construction superintendents and other men upon whom rests the responsibility of getting jobs done quickly and well.

REINFORCED CONCRETE AND MASONRY STRUCTURES. By Hool and Kinne. 722 pages, 6 x 9, illustrated. Price **$6.00**

The work of 14 specialists. This book offers a practical and detailed discussion of every important element entering into the design and construction of concrete and masonry structures. Particularly noteworthy are the very thorough treatments of Reinforced Concrete Buildings, Concrete Forms, Chimneys and Concrete Detailing.

HELPS TO SUCCESSFUL CONTRACTING. By Harry O. Locher. Published in 1934; 222 pages, 5½ by 8 in. Price **$2.00**

An unusual book for contractors, covering every phase of the work from estimating and bidding to cleaning up and moving to the next job. Written by an author with more than 30 years of experience in the contracting business. Every contractor and construction superintendent or foreman should have a copy.

WINTER CONSTRUCTION METHODS. By Charles S. Hill. Cloth, 180 pages, 6 by 9 in., illustrated. Price **$3.00**

This book assembles in one volume the practices found most effective in carrying on concrete construction work in cold weather. Subjects treated in individual chapters include construction of concrete bridges, roads and street pavements in winter; use of special cements in cold weather; heating of materials; handling and placing concrete; protectig concrete in heavy sections; progressive canvas housing for building construction; and use of complete enclosures.

SPECIAL COMBINATION OFFER: $1.50 (or $2.00 for Cement Mill Edition) added to the price of any of the above listed books will entitle you to one years subscription to Concrete or extend your present subscription one year from its present expiration date. Foreign and Canadian subscribers please write for details.

Book Department of CONCRETE, 400 West Madison Street, Chicago, Illinois

HOW TO DO IT

Questions and Answers
Consultation and Comment

A department devoted to the solution of problems encountered in concrete work. Readers are welcome to add to or improve upon the suggestions printed and to submit their views for possible publication.

Prevention of Checking

Is there any way to prevent flat concrete work, such as floors, from checking or crazing?—C. R. J., Jacksonville, Fla.

This question was answered on page 42 of the December (1930) issue of CONCRETE. For the benefit of interested readers who do not have back numbers available, the instructions are here repeated.

The durability and effectiveness of a floor finish depend primarily upon the observance of the fundamental rules for making, placing, finishing and curing concrete. To prevent surface checking, strike off the wearing course to the established grade, and compact it with a wood float. Floating must be followed by steel troweling after the concrete has hardened sufficiently to prevent excess fine material from working to the surface. Do not under any circumstances sprinkle dry cement (or a mixture of dry cement and sand) on the surface of the wearing course. This practice is harmful.

As soon as the finished wearing course has hardened to the point where it will not be damaged, cover it to a depth of at least 1 in. with wet sand, or with special coverings available in the market, and keep the covering wet by sprinkling with water for at least 10 days.

Stopping Leakage Through Basement Wall

I have been called in by a property owner whose concrete basement wall is leaking badly. There are no cracks in the wall; the water comes right through the concrete. I attempted to repair the trouble by means of a 1:1 coating of cement-and-sand plaster, but the leakage continues. Can you suggest any way of handling this problem?—S. D. C., San Diego.

First of all, the cause of the trouble should be removed by placing a drain all around the building, at a level below the basement floor. It is evident that the building is in a wet location.

From the fact that water has been leaking directly through the concrete, we would judge that there is a considerable amount of disintegrated concrete, especially at the surface. This should be chipped away with cold chisels, and the new surface, as well as any unchipped parts of the old surface, should be thoroughly cleaned. Then apply two coats of 1:2½ cement-and-sand mortar, using a quick-setting portland cement. Products now on the market will help to hasten the hardening. Often it is necessary to use such an accelerator, especially when leakage is occurring at the time the mortar is being applied, for in this case quick hardening is most essential.

If water is coming through the joint between the floor and the wall, cut out a narrow strip in the floor, next to the wall, and fill it with the same kind of mortar.

Roughening Smooth Concrete

In this city there are many smoothly finished concrete sidewalks which should have been given a sanded or floated finish when they were placed. Can you suggest any practicable way to roughen these walks? They create a certain amount of danger to pedestrians, especially on slopes.—L. O. K., San Diego, Calif.

Probably the most practicable method for roughening smooth concrete walks or driveways is to use an acid wash. Commercial hydrochloric acid (muriatic acid) is diluted to the extent of one part of acid to about 3 parts of water. This diluted acid is applied to the surface of the sidewalk, the surface being scrubbed meanwhile with a wire brush. The purpose is to remove the thin, smooth coating of hardened cement-and-sand mortar that constitutes the surface of the walk, thereby exposing the coarse aggregates and obtaining the rough surface desired.

After the acid has cut to a sufficient depth it must be completely washed off, or it will continue to act.

In some cases it may be found more practicable to use concrete surfacing tools such as bush-hammers, with which the surface is cut and roughened, the loosened material then being brushed off. Bush-hammering may be done by hand, or with electric or compressed air tools.

Discovery of Water-Cement Ratio Law

Can you tell me something about the experiments that led to the discovery of the water-cement ratio law, and to whom belongs the credit for this discovery?—C. B. C., Saginaw, Mich.

D. A. Abrams is credited with the discovery of the water-cement ratio law. It is true that even before the invention of the process for making portland cement, engineers had some knowledge that the lowest practicable proportion of water, with respect to the proportion of cement, made the strongest concrete. This fact is emphasized in a British specification known as Parker's Specification, published in 1796. Parker's cement was a natural cement, but was made by a process that was fundamentally the same as the process later employed in the manufacture of portland cement.

To Abrams, however, belongs the credit for the discovery of the actual relation between the water-cement ratio and the strength of the resulting concrete. He established this relationship in definite terms, so that it became possible to make use of the law in controlling the quality of concrete in every-day construction work.

The discovery of this definite relationship resulted from an analysis of several thousand tests, in which a record had been kept of the quantity of water used in mixing the concrete for the test specimens. This analysis disclosed increasing strength of concrete as the water-cement ratio decreased. Additional tests then confirmed the relationship and established the law that later was published.

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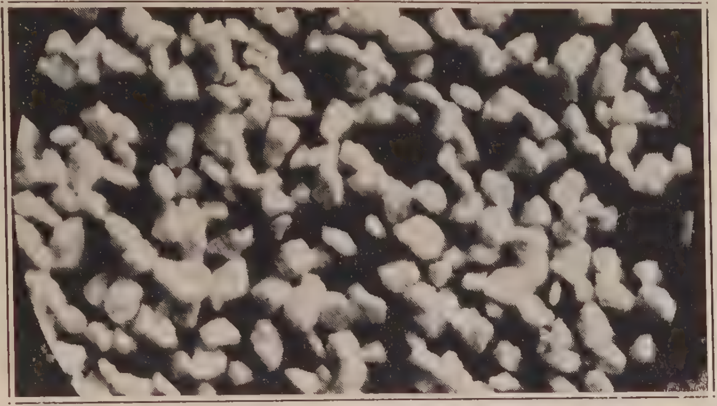

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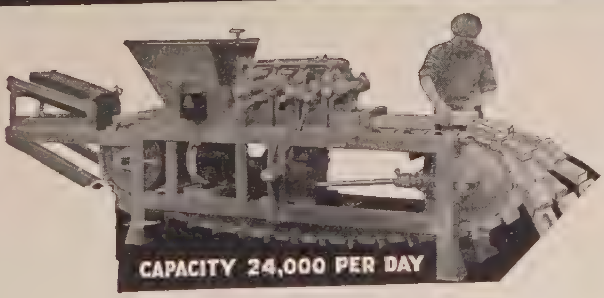

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The Coming Road Convention

THE thirty-second annual convention and highway exhibit of the American Road Builders' Association is to be held in Washington, D. C., January 22, 23, 24 and 25, 1935. The headquarters of the convention, and the exhibit, will be in the Willard Hotel.

The theme of the convention will be: The continuation of an adequate highway program; the use of highway revenues for highway purposes—no diversions; the continuation of Federal appropriations for highway construction.

An entire session will be devoted to a symposium on gasoline tax and motor license fee diversions.

The recommendations and conclusions growing out of the convention sessions should be of inestimable value, not only before Congress in national legislation, but will serve as a guide to the 44 State Legislatures which will convene in 1935.

The exhibit will present for inspection the latest developments in equipment and materials.

There will be two general sessions, and in addition sessions of the County Highway Officials' Division, City Officials' Division, Highway Contractors' Division, and Engineers and Officials' Division, to present and consider the subjects directly applicable to these divisions.

There will be a meeting of the Road Builders' Advisory Council for the purpose of formulating an organized plan to be used in returning to the highway program the $200,000,000 which is now being diverted from gasoline tax and motor license revenues.

This year's convention will be of special importance because the theme will include the foundation of the activities of the future highway program based upon the economics of the highway situation in the country today, and further because the highway construction program is playing such an important part in the recovery program.

Capt. H. C. Whitehurst is president of the association and director of highways.

A Book for Contractors by a Contractor

"Helps to Successful Contracting," by Harry O. Locher, vice-president of Locher & Company, Inc., brings the story of successful contracting to every contractor and construction superintendent who is willing to spend time and effort in absorbing it.

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The price of this book—only $2.00—brings it within the reach of all. Copies may be obtained from the Book Department of *Concrete*, 400 W. Madison St., Chicago. Or, you can obtain the book and one year's subscription to *Concrete* for $3.50—only 50 cents more than the regular subscription price.

This offer applies to renewals and extensions of present subscriptions as well as to new subscriptions. It is an offer that no one can afford to miss.

New Books and Pamphlets

Analysis of Rigid Frames

Handbook of Rigid Frame Analysis. By L. T. Evans, licensed structural engineer, 421 Rhea Street, Long Beach, Calif. Published privately by the author. Cloth, 161 pages, 8½ by 11 in. Numerous tables, diagrams and full-page design charts. Price $4.00.

The primary purpose of this book is that of providing brief discussions of the fundamental principles involved in the analysis of single and multiple-story rigid frames, then applying those principles, by means of design charts and other aids, to the problems encountered in structural engineering design offices.

While the slope-deflection method is the basic method followed, its use has been reduced to the highest possible degree of simplicity. The design methods set forth in this book have been regularly used by the author in his own office work.

Profits with Concrete Ashlar

Keys to Profits with Concrete Ashlar is the title of a new 10 by 14-in., 16-page illustrated publication issued by the Portland Cement Association, 33 W. Grand Ave., Chicago.

Prepared primarily as a manufacturing and sales aid to the manufacturer of concrete ashlar units, this planograph is of definite value to architects as well. Separate sections cover subject-matter such as (1) Manufacturing Equipment, (2) Displays and Samples, (3) Prospects, and (4) What Prospects Want to Know. Patterns, textures, coloring, joints, cost data, and other factors involved in the production and use of concrete ashlar are discussed under their respective subheads.

Copies should be in the hands of all products manufacturers, architects and contractors.

Concrete Bridge Details

Concrete Bridge Details, a 48-page illustrated booklet just published by the Portland Cement Association, 33 W. Grand Ave., Chicago, supplies bridge engineers with valuable information on the correct treatment of details in the design and construction of concrete bridges.

Before publication, the booklet was reviewed by several nationally known bridge engineers who offered constructive suggestions that resulted in improved details. Among the subjects discussed and the details shown are abutment movements, wing walls, bridge seats, bearings, expansion joints, prevention of seepage, wearing surfaces, hand railings, construction of approach slabs, and creep in skew bridges.

Handbook on Curing Concrete

Columbia Manual of Concrete Curing is the title of a 60-page, flexible-cover manual of handbook size (4¼ by 7 in.) published by the Columbia Alkali Corp., Barberton, Ohio.

The manual is devoted mainly to the use of calcium chloride in the curing of concrete, both integrally and as a surface application. It contains much useful engineering information, and it is suggested that engineers and contractors interested write for copies.

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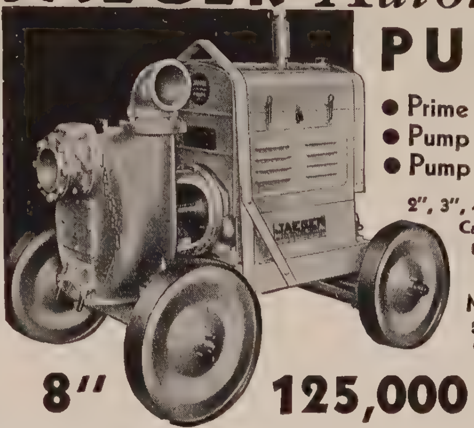

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EQUIPMENT AND MATERIALS

Industrial Literature

HOME Improvement Pictorial is an 8-page rotogravure magazine, published by the Portland Cement Association, Chicago, to show property owners the versatility of concrete as a modernizing aid. It pictures examples of new concrete steps, walks, driveways, garages, garage floors, porches, portland cement stucco overcoating, back yard play courts, garden pools, basement living rooms and other practical improvements in concrete.

On the back is a check-list of 65 modernizing suggestions using concrete, with space for contractors, cement dealers, civic groups and others to imprint name and address before distributing to property owners.

Quantities of this rotogravure are available at a nominal price. Because of its low cost and general interest, chambers of commerce, newspapers and other organizations interested in local housing campaigns are co-operating in its distribution.

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THE World's Most Popular Pneumatic Tools is the title of a new eight-page bulletin recently issued by Ingersoll-Rand Company, New York, N. Y. The bulletin lists the company's new sizes of "Multi-Vane" drills and push-throttle screw drivers and nut setters. It also illustrates and gives size-and-capacity tables of the I-R pneumatic drills, grinders, riveters, chippers, rammers, wrenches, hoists, etc.

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CONCRETE roads unbeatable—The Portland Cement Association, Chicago, has published a 24-page booklet, entitled "An Open Letter to Henry Ford." The booklet summarizes tests, experiences, and studies of roads and road costs and proves beyond all doubt that concrete roads are still "unbeatable." The booklet is presented to Mr. Ford, they say, because of his interest in the American motorist.

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WORTHINGTON Group D monobloc centrifugal pumps are simple, reliable, low-cost pumping units described in Bulletin No. 2-D-12. These pumps are suitable for air conditioning installations, water heater units, refrigeration machinery, laundry equipment, bakery machinery, boiler return systems, breweries and chemical processes.

STONHARD STONTITE, a liquid material said to stop leaks ranging from streams the size of your fist to occasional seepage, is a recent development in the field of waterproofing.

Any handy man, the Stonhard Company of Philadelphia says, can use Stonhard Stontite to waterproof foundations, walls, elevator pits, floors, tunnels, swimming pools, reservoirs, dams, aqueducts—in fact anything constructed of concrete.

•

CHARON is an emulsified carbon black used to color concrete roads and streets. Glare is eliminated, according to the makers—Golfrey L. Cabot, Inc., Boston—traffic stains are absorbed and traffic markers stand out. Repairs or replacements match the colored concrete perfectly, they say.

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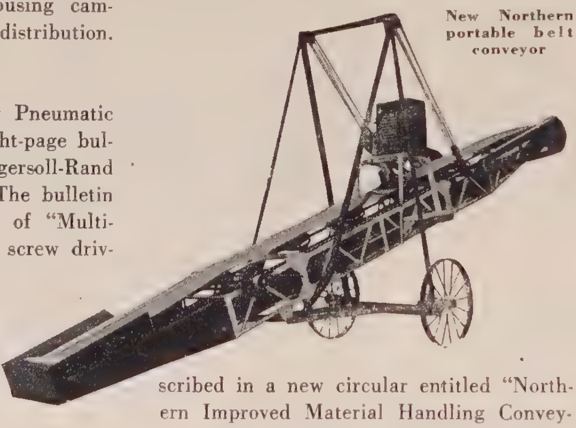
NORTHERN Conveyor Company, Janesville, Wisconsin, maker of material handling equipment has a new model described in a new circular entitled "Northern Improved Material Handling Conveyors."


New Northern portable belt conveyor

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GILSOLOID is a waterproof finish especially prepared for concrete burial vaults by the Automatic Sealing Vault Company of Peru, Indiana.

Gilsoloid, they say, uses Gilsonite as its base, and is available in brown or dark green. Samples are available.

PERSONAL

L. S. Stephens has been elected to succeed *D. B. Piersen* as president of the Stephens-Adamson Mfg. Co., conveyor manufacturers of Aurora, Illinois. Mr. Piersen, one of the founders of the firm in 1901, was made chairman of the board upon the resignation of W. W. Stephens of Pasadena, California. The new president has been active in the firm since 1914.

Manufacturers' News

EUGENE F. OLSEN announces his return to the concrete products machinery business. For years Mr. Olsen was general manager of the Anchor Concrete Machinery Co. and of the Consolidated Concrete Machinery Co., and later vice-president and sales manager of the Besser Manufacturing Co. He is now general manager of the Stearns Manufacturing Co., an old established concern just now embarking in the manufacture of concrete block and tile machines and products plant mixers.

This company's plant at Adrian is that formerly occupied by the Anchor Concrete Machinery Co. Most of the present employees were also employees of these companies.

The Stearns company is now supplying repair parts and supplies for different makes of concrete block, brick and tile machines and mixers and this service feature of the business is one that is being given a great deal of attention.

The Stearns Manufacturing Company also represents Neff and Fry of Camden, Ohio, as distributors of burial vault equipment and licenses.

An improved stripper block machine will be brought out later this year as well as a products plant mixer that is said to embody many new and interesting features of design. Other items in a complete line of concrete products plant equipment are to be announced from time to time.

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SIXTY bags of cement at 94 lb. each is the capacity of a General Motors T-18 recently placed in service by the Allied Builders Supply Corporation of Brooklyn, N. Y., according to the manufacturers. Special equipment on the job includes a two-yard body with one-yard extension side boards built by the Metropolitan Truck Equipment Corporation, and a St. Paul hydraulic hoist.

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HERCULES Powder Company announces that work will begin shortly on a new plant at Parlin, N. J., for the manufacture of Tornesit, the company's new protective coating material. Tornesit is a chlorinated rubber product said to have great resistance to acids, alkalies, fumes, and other destructive elements.

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No. 11

Cement Mill Section of
Concrete

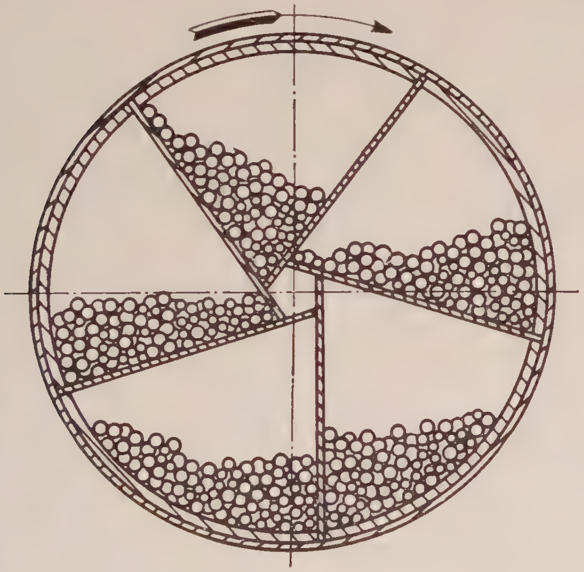
NOVEMBER
1934

Power Requirements Greatly Reduced in New Compound Tube Mill

Fine-Grinding Compartment Subdivided into Five Longitudinal Cells—Arrangement Lowers Resistance to Rotation—Obsolete Mills Can Be Modernized

The description here presented is translated from an article by R. Herrmann, consulting engineer, in the May (1934) issue of the Spanish periodical Cemento (Barcelona).—Editor.

THE cost of power consumed in the grinding of raw material and of cement clinker represents an important part in the cost of manufacturing cement. For this reason there has been no lack of determination to improve the efficiency of compound mills designed mainly for this purpose.



Earlier Improvements in Grinding Mills

In the earlier developments, such forms as were considered most appropriate were given to the lining of the tube mill as well as to the division walls between the different compartments of the mill. Then the grinding bodies, or balls, were selected with the greatest care, as to kinds and quantity, with the view toward obtaining the greatest extent of productive power out of the energy employed in driving the tube mill.

It has been established that the highest efficiency in grinding is obtained with a charge of grinding bodies equal in volume to somewhere from 20 to 40 per cent of the interior cubical contents of the mill, depending on the shape of the lining plates of the mills and the shape of the grinding bodies, or balls. This percentage determines the weight of the grinding bodies and also the necessary number of revolutions of the mill, per minute.

Calculation of Power Requirements

The weight of the charge of grinding bodies, expressed in kilograms and designated by the symbol P, and the distance between the center of gravity of the grinding bodies and the center of the mill, expressed in meters and designated by the symbol a, creates a reverse moment of rotation equal to Pa meter-kilograms. Then from the number of revolutions of the mill per minute (designated by the symbol n), one may calculate the required motive power from the formula—

$$\frac{N}{H\,p} = \frac{P\,a\,n}{716}$$

In cases where the percentage of volume of grinding bodies is low, in comparison with the total cubical con-

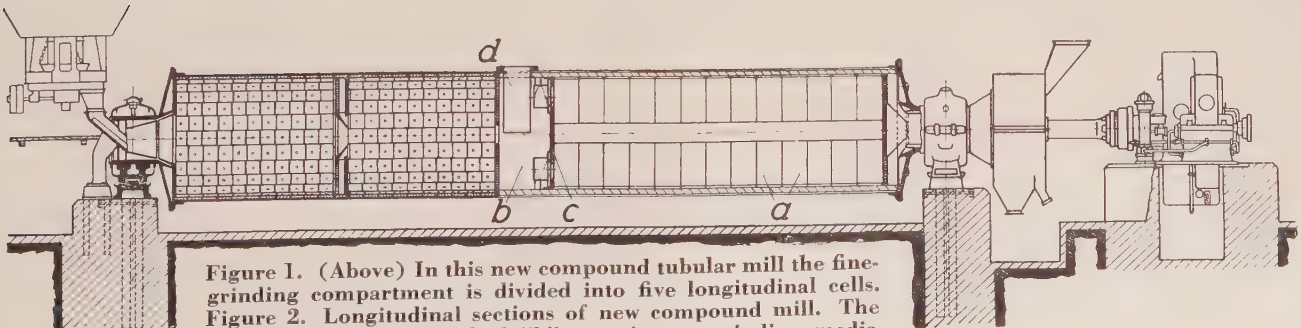


Figure 1. (Above) In this new compound tubular mill the fine-grinding compartment is divided into five longitudinal cells. Figure 2. Longitudinal sections of new compound mill. The short compartment marked "b" contains no grinding media

tents of the mill, the distance *a* from the center of the mill to the center of gravity of the grinding bodies is relatively large; and, of course, that is also true of the moment of rotation.

New Tube Mill Utilizes Less Power

Because of this circumstance, a new tube mill has been developed which makes it possible to rotate a large tonnage of grinding bodies with a reduced moment of rotation. The power requirements of this mill are correspondingly reduced.

It is certain that with an increased percentage of the charge of grinding bodies (as compared with the cubical contents of a mill), a more favorable relationship is created with respect to power consumption; but at the same time there is also a reduction in the extent of the falling movement of the grinding bodies—an operation so favorable and indispensable to good grinding. In consequence, the production capacity of the mill is diminished.

Fried. Krupp Grusonwerk A. G., of Madgeburg, Germany, have succeeded in accomplishing a distinct advance in this direction. Their new "Concentra" compound tubular mill facilitates the movement of a large tonnage of grinding bodies with reduced power requirements, without reducng the extent of the dropping movement of the balls, so necessary to effective grinding.

Fine-Grinding Compartment Is Subdivided

The new mill is equally appropriate for grinding, whether under the wet or the dry process of operation. Its principal characteristic is that the compartment for fine grinding is divided into five equal longitudinal cells, as will be seen in Figure 1. Each of these longitudinal cells contains a corresponding charge of grinding bodies, thus resulting in five separate moments of rotation, which, in part, compensate each other. The surplus, or uncompensated, moment of rotation to be overcome by the motive power is considerably less than that of the usual type of mill; that is, the "Concentra" mill offers an important economy in power consumption.

Tests Prove Superiority of New Type

Having succeeded, as a result of painstaking tests, in giving these longitudinal cells a form such that the grinding bodies produce a favorable grinding effect, the result is seen in the distinct superiority of this mill as compared with older types of more simple construction. From the beginning, and with the first introduction to practical application, it has been possible to establish definite proof by superiority. These tests were conducted in a modern compound mill of three compartments (the necessary modifications having been made), located in a portland cement manufacturing plant in northern Germany. The modified mill, before alterations were made, was a "Krupp-Centra" mill of three compartments, with a total length of 42 ft. 8 in. and a diameter of 6 ft. 6 in. This plant had been equipped with two of these mills.

Power Requirements Reduced 23 Per Cent

One of these mills was, accordingly, equipped with the newly disposed "Concentra" arrangement in the fine-grinding compartment. This compartment was 13 ft. long. By means of comparative tests between the modified mill and the twin mill in its original state, it developed that the capacity and also the degree of fineness were the same in each mill. The modified mill, however, required considerably less power—that is, its power requirements were 435 hp., while that of the original mill was 570 hp. Thus the installation of the "Concentra" system resulted in a reduction of 135 hp. in power consumption, or a saving of 23 per cent. The material that was ground during these tests was a clinker from a rotary kiln, which was ground to a fineness such that 6 per cent was retained on a No. 70 sieve (178 meshes per lin. in. in American practice).

Another Big Saving in Power

In another case an Andreas compound mill was modified by installing the longitudinal divisions of the new system in the fine-grinding compartment. The Andreas mill under discussion is 7 ft. 3 in. in diameter and 46 ft. long. Before the alterations were made we conducted a test run of 12 hours' duration, with a carefully weighed charge of grinding bodies, in order to determine exactly the capacity, the power consumption, and the fineness of the product.

After the reconstruction of the mill in accordance with the new system here described and illustrated, a similar test run was conducted. From this second test run it was established that with an equal degree of fineness of the product and a 10 per cent increase in capacity, the power consumption was diminished by 29.4 per cent. In this mill the actual saving of power amounted to about 200 kw. That is, in 20 hours of operation per day, there would be a daily saving of 4,000 kwh. From this it is easy to calculate that the cost of the installation was quickly repaid by the power saved.

No Reduction in Quality

Especially worthy of emphasis is the fact that this economy in power consumption was not obtained at the cost of quality. Not only did the fineness of the product remain unaltered, but the flour content also remained the same. Comparative tests conducted in the laboratory of the Society of German Manufacturers of Portland Cement, for the purpose of verifying the fineness of cement produced in an ordinary mill, as compared with the "Concentra" mill, gave the results shown in the table.

COMPARATIVE TESTS OF FINENESS

Size distribution	Ordinary mill	"Concentra" mill
0 to 10 μ	24.9	24.5
10 to 20 μ	17.9	17.5
20 to 30 μ	12.2	11.8
30 to 40 μ	9.9	9.9
40 to 50 μ	9.9	9.8
50 to 60 μ	6.7	6.6
60 to 88 μ	10.4	11.3
88 to 100 μ	2.4	1.8
Coarser than 100 μ	5.7	6.8
	100.0	100.0

An additional advantage of the new mill is seen in the fact that the product of grinding, when discharged from the mill, has a lower temperature than that observed with the ordinary compound mill, all other conditions being identical.

Interior Construction of New Mill

Figure 2 represents a longitudinal section of a compound "Concentra" mill. The fine-grinding compartment of this mill is divided into five cells by means of the division plates *a*, the cells being charged with a certain amount of grinding bodies. In advance of the fine-grinding compartment there is seen (in Figure 2) a short "transitory" compartment *b*, not containing any grinding bodies. From this compartment *b* the material to be ground is charged into the separate longitudinal cells in compartment *a* through the division wall *c*, by means of a special construction.

The transitory compartment *b* is also provided with a device *d*, which forces additional fresh air into the interior of the mill, thus resulting in an intensive ventilation of the longitudinal cells in compartment *a*.

The walls of the "Concentra" compartments are of steel, specially treated to render it resistive to abrasion, thus guaranteeing long life to the parts of the interior construction. Thus it has been observed that scarcely any abrasion of these parts has occurred in a "Concentra" mill after more than 3,000 hours of operation, grinding the clinker of a rotary kiln.

All the interior parts of this new mill are designed of such dimensions as to permit the individual pieces to be passed through the man-hole, in order to facilitate the replacement of parts. The grinding bodies are dropped into the individual cells and compartments through hand-holes, provided for this purpose in the shell of the mill.

Obsolete Mills Can Be Modernized

Grinding mills of obsolete types can be provided with this new "Concentra" system, regardless of whether the finished product is discharged through the periphery of the mill, or through the hollow supporting shaft or gudgeon. To permit this modernization, however, it is necessary that a mill have a diameter of not less than 6 ft. or thereabouts.

The development of the interior construction of this new mill represents an important advance in the technology of grinding, in the course of which it has been possible to obtain a decided increase in the output of tube mills. In combination with the "Concentra" drive, in use for some years, this new mill represents a system of grinding that will be difficult to excel in the matter of output and of reliability in service.

Expect Increase in Cement Shipments

AN increase of 12.8 per cent in cement shipments in the Atlantic States territory is expected in the final quarter of 1934, as compared with the last quarter of 1933, according to reports submitted at the 35th regular quarterly meeting of the Atlantic States Shippers Advisory Board, 30 Vesey St., New York. Estimated commodity tonnages for various industrial products are as follows:

	Total Carloads in Quarter		Percentage of Change	
Commodity	Actual, 1933	Estimated, 1934	Increase	Decrease
Cement	14,712	16,595	12.8	
Brick and clay products	2,222	2,122		4.5
Lime and plaster	2,015	1,872		7.1
Iron and steel	24,713	23,477		5.0
Gravel, sand and stone	21,744	18,639		14.4

Census of Cement Manufacture

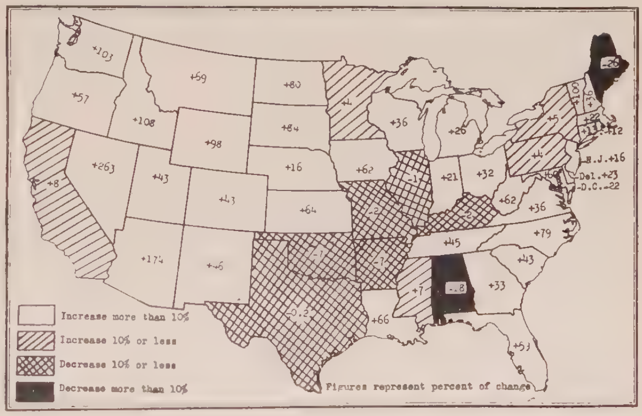
WAGE-EARNER employment in the manufacture of cement increased rapidly during the spring and slowly during the summer of 1933, but decreased somewhat during the last quarter of the year, according to a preliminary report compiled from data collected in the Biennial Census of Manufactures taken in 1934, released on October 16 by Director William L. Austin, Bureau of the Census, Department of Commerce. The figures for the final months of the several quarters of the year show 11,639 wage-earners at work in March, 18,061 in June, 18,982 in September, and 15,233 in December.

The total value of products made in 1933 by establishments engaged primarily in the manufacture of cement amounted to $86,921,018, as against $148,845,075 reported for 1931 (the last preceding census year) and $267,509,260 for 1929. The rates of decrease for the two biennial periods are—1931-1933, 41.6 per cent; 1929-1931, 44.4 per cent.

The number of establishments considered for 1933 were 148; for 1931, 164; and for 1929, 174.

Cement Map Shows Continuance of Favorable Trend

IN the 8-month period ending August 31, 1934, the cement map of the United States presents a picture slightly more favorable than in the 7-month period ending a month earlier. During the more recent period, shipments of cement in 40 states ranged from 4 to 263 per cent greater than in the corresponding period of 1933, according to the U. S. Bureau of Mines. In 8 states the shipments were less, the decreases ranging from 0.2 of one per cent to 26 per cent. Only two states reported a decrease of more than 7 per cent. Comparisons with corresponding periods of 1933 follow:



	Number of States	
Period considered	Reporting decrease	Reporting increase
12 months ending Dec. 31, 1933	34	14
6 months ending March 31, 1934	17	31
6 months ending June 30, 1934	7	41
7 months ending July 31, 1934	10	38
8 months ending Aug. 31, 1934	8	40

Lubrication and Lubricants Applied to Cement Mill Operation

Types of Lubricating Oils and Greases Discussed Before National Association — Testing Apparatus Developed

LUBRICANTS for industrial anti-friction bearing applications include lime soap, soda soap, aluminum stearate, lead base, and mixed base greases, together with oils of various degrees of refinement ranging from the light bodied non-viscous oils to the heavy cylinder stocks. These lubricants take care of practically all types of bearings. There are, however, a number of applications which are heavily loaded, or where the speeds are such that a new kind of lubricant, such as the extreme pressure type which has come to the fore during the last few years, should be used. These "alloyed lubricants" serve a definite type of service in the lubrication field, just as alloy steels do in modern industry.

Imparting Extreme Pressure Properties

Extreme pressure properties may be imparted to either oils or greases. There are on the market today extreme pressure greases of practically all types, and extreme pressure oils covering the range of viscosities used for lubricating various bearings in service.

When subjected to high operating temperature, and as a rule with higher operating needs, a soda soap lubricant is usually preferable. Many greases have the disadvantage that, with the higher operating temperatures encountered on higher speed units, there is a marked tendency for the lubricants to become thin. Aluminum stearate greases will usually return to their original consistency even if they are heated considerably above their melting point. This property can not as a rule be imparted to lime or soda soap greases.

Extreme Pressure Greases

In some of the applications where past experience indicates that extreme pressure greases are not necessary, they have been used without any harmful effects. Therefore, in order to be on the safe side, the Timken Company has made it a practice to recommend extreme pressure greases entirely for this service. No one knows when some operating condition is going to cause overloading.

Often gears and anti-friction bearings are lubricated with the same lubricant. In this case the mineral oil which is satisfactory for the gears is usually entirely satisfactory for the anti-friction bearings.

For Ball Mills and Clay Mills

Sight feed, constant level and wick feed oilers are ordinarily used on industrial equipment, the latter two usually being the most economical. In order to have a product that is economical for use with sight feed oilers, oils compounded with around ¼ to ½ per cent of soaps are used. Such compounded oils adhere better to bearing surfaces and also feed more slowly.

Ball mills, clay mills, etc., represent applications where the service is heavy and the speeds somewhat low. Usually heavy cylinder oils are entirely satisfactory for lubricating such applications, although at times it has been found advantageous to use extreme pressure products. By using a lighter bodied oil, but of the extreme pressure type, it is possible to reduce operating temperatures considerably, and also to show a marked saving in power. At the same time the heavy loads can be carried without harmful effects to the gears or bearings.

Circulating Oil Systems

There are a number of applications where circulating oil systems are desired, such as on gear drives, and the bearings connected with them in mills or other industrial units. The following advantages may be attributed to circulating oil systems:

(1) Ample lubrication.

(2) The circulation of the oil through the bearings has a cleaning action, washing out any foreign matter that might be present.

(3) There is no churning of the lubricant; hence, with the minimum amount of lubricant present, lower operating temperatures are generally secured.

(4) With a circulating system it is possible to provide for settling and filtering the lubricant. In case the lubricant has a tendency to become warm, it is possible to cool it separately, thus keeping the system supplied at all times with clean, cool lubricant.

(5) The cooler operating conditions will reduce the oxidation or breaking down of the lubricant and thus increase its life.

There are, of course, instances where it is not feasible to install a circulating oil system. In such cases a fixed level oil bath should be maintained and provision made for changing the lubricant at frequent intervals.

Testing Apparatus

In order to measure in the laboratory the film strengths of various types of lubricant which might be encountered, the Timken Roller Bearing Company developed a lubricant and wear testing machine, which has been quite helpful in obtaining data to help solve problems with which the company has been confronted. Straight mineral oils increase in film strength with increase in viscosity, and this machine demonstrates that fact.

It is realized that considerable work still remains to be done in the development of various types of lubricants to meet the advancing needs of anti-friction bearings. Our company is constantly conducting tests on suggested products, and co-operating with oil and grease manufacturers in an endeavor to solve the needs of the various fields in which bearings are used.

Condensed from paper presented before the National Association of Lubricating Grease Manufacturers, Chicago, Ill., October 17, 1934, by O. L. Maag, Lubricating Engineer, Timken Roller Bearing Co., Canton, Ohio.

Twenty-Third Annual Safety Congress Meets

Cement Section Officers Re-elected—Accidents and Fatalities Increase—"Occupational Injury" Replaces "Accident"

THE minutes of the cement section meetings at the twenty-third annual Safety Congress — National Safety Council—held at Cleveland, Ohio, October 3 and 5, contain much interesting information. The following is abstracted from these minutes as reported by A. J. R. Curtis, Secretary.

J. B. Zook, as chairman of the cement section, welcomed those present and remarked about the fine attendance. In his paper "Our Work—Today and Tomorrow" he stressed the fact that only by hard work could we correct the conditions which were putting the fine safety record of the cement industry in reverse since 1933. He announced that the Engineering Committee cooperating with the National Safety Council had published one Cement Section safe practices pamphlet during the year on "Raw and Finished Cement Mill Grinding," and in addition, had cooperated with the General Safe Practices Committee of the Council in reviewing nine pamphlets.

Poster Committee Report

Mr. Zook read the report of the Poster Committee, submitted by M. P. Greer, chairman. This report reviewed the efforts of the Committee in attempting to get photographs from each member plant for use in posters and film strips. The Committee sent in ideas for thirty Cement Section posters.

The Membership Committee reported that there was a net gain of two members in the Section for the year.

Election of Officers

The Nominating Committee, of which H. A. Reninger is chairman, recommended unanimously that all officers be retained for another year. All officers were re-elected for the year 1934-35. They are:

General Chairman—J. B. Zook, Great Lakes Portland Cement Corp., Buffalo, N. Y.

Vice-Chairman—W. W. Hamilton, Alpha Portland Cement Co., Easton, Pa.

Secretary—A. J. R. Curtis, Portland Cement Association, Chicago, Ill.

News Letter Editor—Jack Dempster, Canada Cement Co., Ltd., Pt. Colborne, Ont., Can.

Engineering Committee Chairman—Frederick B. Hunt, Nazareth Portland Cement Co., Nazareth, Pa.

Membership Committee Chairman—H. A. Reninger, Lehigh Portland Cement Co., Allentown, Pa.

Poster Committee Chairman—M. P. Greer, Marquette Cement Manufacturing Co., Cape Girardeau, Mo.

Program Committee Chairman—D. B. Coleman, Missouri Portland Cement Co., St. Louis, Mo.

Members at Large—R. B. Fortuin, Pennsylvania-Dixie Cement Corp., Nazareth, Pa.; E. Posselt, International Cement Corp., New York, N. Y.; C. E. Ralston, Pittsburgh Plate Glass Co., Pittsburgh, Pa.; F. E. Town, Manitowoc Portland Cement Co., Manitowoc, Wis.; H. Vanderwerp, Medusa Portland Cement Co., Cleveland, Ohio.

Curtis Analyzes Accidents in Cement Industry

A paper "Analysis of Accidents in the Cement Industry" was presented by A. J. R. Curtis, assistant to the manager, Portland Cement Association. Mr. Curtis brought out effectively the fact that safety was not a static thing and that the cement industry could not coast along on the splendid record of the past few years. Danger of this attitude is evident in the experience of the first eight months of 1934 which show that all accidents increased 55.5 per cent over the corresponding period of 1933 with an increase of 42.8 per cent in fatalities. Not only were the number of accidents greater but there were a greater number of plants contributing to the accident experience. Several interesting analytical comparisons of experience in 1934 against 1933 were made, including an analysis of accident locations by departments. He discussed the relationship of accidents to production and showed that during the past year, particularly, there has been little relationship between the two. He stressed the need for a careful check-up of the individual plant safety program and asked that every plant set up a program of specific activities and then carry them out with a determination to complete them on schedule.

News Letter Editor Jack Dempster commented on the success of the safety essay contest conducted by Southwestern Portland Cement Company, and pointed out the value of such a contest in stimulating the man on the job to think creatively about safety. He announced he was going to eliminate the word "accident" in the News Letter and replace it with "occupational injury" because the latter infers control and the word "accident" does not,

Greer-Wishman Give Joint Paper

M. P. Greer, safety engineer, Marquette Cement Manufacturing Company, Cape Girardeau, Mo., limited his discussion to the question "How to Investigate Our Accidents." Mr. Greer explained the responsibility of the foreman in investigating any occurrence in his department which affects production and pointed out that this same responsibility should carry over to accidents occurring in his department. He stated that every accident, whether or not it resulted in injury, should be thoroughly investigated with three objectives in mind: 1. To find the direct and contributing cause. 2. To fix responsibility. 3. To prevent recurrence.

It is highly important that immedate action be taken so that all evidence will be intact and the minds of witnesses fresh. Mr. Greer outlined several methods used by various companies in choosing investigating committees and then explained the committee set-up in his own company, which consists of the foreman of the department in which the accident occurs, a workman in the same department, and the safety director. This has several advantages over a fixed committee in that it allows interchange of members, quick action and familiarity with the conditions surrounding the accident. The investigation is not complete unless it determines all the contributing causes of an accident and fixes the responsibility in a fair, impartial manner, which will permit a just penalty to be imposed.

O. E. Wishman, safety engineer of the Lawrence Portland Cement Company, Thomaston, Maine, completed the joint paper, discussing "How to report and capitalize our accidents." Mr. Wishman emphasized the fact that it is only luck when an accident doesn't result in an injury and stated that it was easy to find how an accident occurred but not easy to find why. The why of an accident is the objective of investigating and reporting. The foreman should be required to fill out report blanks on all accidents and Mr. Wishman suggested that questions be used which would give a picture of conditions prior to the occurrence. The injured employee should also fill out a report form which would give a clue to his understanding of the work he was doing and whether or not he was sufficiently instructed.

Reports of accidents should be capitalized through four agencies: (1) The management; (2) Supervisors; (3) Workers, and (4) Industry at Large. The most important element in capitalizing an accident is speed.

Worthy Uses Movies

W. J. Worthy, superintendent of the Medusa Portland Cement Company, Toledo, Ohio, made a thorough presentation of the subject "Safetyizing Transportation in Cement Mills and Quarries" and illustrated his paper with 600 feet of motion picture film prepared for this occasion, showing both safe and unsafe practices. Mr. Worthy pointed out that the transportation hazards could be classed as follows: (1) improper construction and design; (2) improper equipment; (3) equipment poorly maintained; (4) lack of management cooperation; (5) inefficiency of plant supervision, and (6) individual carelessness. He stressed the importance of correlating the safety work of various interlocking departments and discussed in detail specific hazards and means of preventing injuries. He then outlined three requirements of an effective safety organization:

1. Management support and approval of such things as machine guarding and maintenance; purchase of safe tools; support of welfare work, and safety meetings and gatherings.
2. The organization of safety committees, including all department heads and foremen, charged with carrying out the safety program and mediating all safety matters between the workers and management.
3. Pressure on individual workmen through personal talks by the foreman and educational propaganda.

Rice Talks on Falls

W. P. Rice, superintendent of the Crescent Portland Cement Co., Wampum, Pa., presented a paper covering the subject, "Preventing Falls of Persons in the Cement Industry." Mr. Rice emphasized the importance of falls. pointing out that approximately one-half of injuries occurring in industry as well as in public places were due to falls and that from a total of 8 fatal accidents in the cement industry during 1933, 4 of these were due to falls. either of persons or objects.

In commenting on a number of specific and typical accidents caused by falls, Mr. Rice offered a detailed statement of the standard practice covering the construction of stairs and treads. He then pointed out the fact that even when physical properties are made completely safe from an engineering standpoint it must be realized that a large percentage of persons do not walk properly. He discussed ladders and ladder accidents and offered many excellent suggestions for the kind of ladders to be used and their safe maintenance, stressing the fact that no ladder should be painted, and that linseed oil should be the only covering. He recommended that one man should make a regular inspection of ladders and subject them to a physical test at regular intervals.

Mr. Rice pointed out that proper allowance should be made in time and working methods to do every job safely and that the custom of studying every job to discover its hazards must be followed by the supervisor if accidental injuries from non-mechanical causes are to be eliminated. He then touched on the desirability of a weekly inspection, careful observances of good housekeeping practices, wearing of proper shoes with a positive grip to prevent slipping, physical fitness by means of periodic physical examinations, the proper thorough instruction of new workers, constant education of all workers in the causes of falls and finally, cooperation from all workers.

During discussion the question was asked how to get cooperation on a job which involved more than one contractor or employer and an example was cited telling of two fatal accidents occurring in a quarry where responsibility was divided. This question precipitated a general discussion with the comment that in some states inspectors representing the state would aid in maintaining safe conditions.

Groner Discusses Hand Tool Accidents

W. T. Groner, superintendent of the Southwestern Portland Cement Company, Osborne, Ohio, next presented a paper on, "Hand Tool Accidents and Their Prevention." Mr. Groner prefaced his paper with an interesting review of the evolution of hand tools from the time of prehistoric man. He then quoted statistics from the records of the Ohio Industrial Commission and the Department of Labor of New York State which proved that the improper use and care of hand tools was an extremely important cause of accidents. From an analysis of 100 lost-time accidents from hand tools, it was found that the employer was responsible for 46 cases; the worker for 34, and 20 to joint responsibility of employer and worker.

Round Table Discussion

Following Mr. Groner's paper, Chairman Zook opened the meeting for a round table discussion and suggested the question, "What Effect on Employees' Attitude Does the Present Necessary Economy Measures Have, Particularly Relating to Company Loyalty and Safety?"

It was the general feeling that the employer's attitude was of extreme importance and that sincerity and fairness would always reflect back on the management. Comment was made on the necessity of proper individual training in the simplest details and technique of every job, and the fact was stressed that this training program must be carried to what would appear to be extremes if control of accidents are to be hoped for.

Denmark to Build Largest Cement Kiln

WHAT is said to be the largest cement kiln in the world will shortly be constructed in Denmark, according to advices to the Commerce Department from Assistant Trade Commissioner Paul H. Pearson, Copenhagen, permitting a larger output at a lesser cost.

EDITORIAL

Cement Industry's Fuel Consumption

DURING the month of July, 1934, the cement industry's fuel consumption totalled 370,480 short tons of coal, 6,375,264 gallons of oil, and 2,857,336,000 cubic feet of natural gas. The July production of finished cement was 8,134,000 barrels.

In July, 1933, when the production was practically the same (8,609,000 barrels of finished cement), the industry consumed 422,670 short tons of coal, 7,439,838 gallons of oil, and 2,389,291,000 cubic feet of gas.

Assume that the average heat value of the coal was 12,500 B.t.u. per pound, the oil 140,000 B.t.u. per gallon, and the natural gas 1,100 B.t.u. per cubic foot. Then, expressing the sum of the three heat values in terms of coal testing 12,500 B.t.u. per pound, the fuel consumed during July, 1934, amounted to the equivalent of 131 pounds of coal per barrel of finished cement produced.

A similar analysis of the fuel consumption in July, 1933, indicates that the equivalent of 132 pounds of coal per barrel of finished cement was required.

All other things being equal, it might be expected that the fuel requirements per barrel of finished cement would be a little higher in July, 1934, than in July of last year, because the total production was slightly less than last year.

In consequence, the improvement accomplished in the period of one year may be a little better than the figures indicate, although the reduction is not large enough to give rise to much enthusiasm.

There may be some significance in the fact that a similar analysis of fuel consumption in August, 1934, when production dropped a little further (to 7,863,000 barrels of finished cement), indicates the equivalent of 124 pounds of coal per barrel of finished cement produced. Again, this reduction may be accounted for by ordinary fluctuations.

The record of fuel consumption will bear further study, with the view of determining whether a downward trend is in progress.

Another Contribution to Lower Production Costs

COMPOUND multiple-compartment mills were introduced to the cement manufacturing industry about 1920; but the leading article in this issue suggests the probability that the last word has not yet been spoken in the development of this manufacturing unit, which, in principle, is a ball mill and a tube mill combined.

This recent improvement—the division of the fine-grinding compartment into five longitudinal cells—is accomplished in a relatively simple manner.

As in so many of the cement mill equipment developments of recent years, this new mill results in reduced power requirements, and, therefore, in reduced fuel requirements. It constitutes another opportunity to attain lower production costs, especially in plants that are now using obsolete grinding equipment.

What Is the Ideal Coal?

PULVERIZED coal, because of its cheapness as compared with gas and oil, will doubtless continue for many years to be the leading fuel in burning cement clinker.

Because of the high temperature obtained from pulverized coal, ranging from 2,500 to 4,000 deg. F., even the cheapest grades can be utilized under proper conditions. In consequence, the cheapest coal available is the one commonly used.

Many cement plants, however, have a choice of several cheap grades. What, then, is the ideal composition to be kept in mind when selecting coal?

The late Richard K. Meade, an American authority on cement manufacture, describes the ideal coal as that containing 30 to 45 per cent of volatile and combustible matter, 49 to 60 per cent of fixed carbon, and ash as low as can be obtained with cheap coals, but not exceeding 25 per cent. A. C. Davis, a British authority, describes the ideal coal for burning cement in rotary kilns as one containing less than 5 per cent of moisture, not less than 20 per cent of volatile matter, and not more than 10 per cent of ash.

In any specific cement plant the coal that has long been used is not necessarily the most suitable of the cheaper grades within reach of that plant. Careful investigation in this direction might disclose the availability of other cheap coals with a composition approaching more closely to the ideal.

Vertical Unions in Cement Industry

THE decision of the American Federation of Labor to charter industrial unions of the vertical type in the cement and other mass production units, says a recent article in the Norfolk (Va.) "Pilot," marks the longest step yet taken toward this plan of labor organization.

This new step constitutes a definite departure from the Federation's former rigid adherence to the crafts union idea. Not only are charters to be issued for national and international unions in the cement, automotive and aluminum industries, but similar unions are to be sanctioned for iron and steel.

In view of these new labor policies, cement plant managements may count definitely on the advent of the vertical union in this industry.

Removal of Sulfur Compounds from Waste Gases

Application Seen in Case of Cement Kiln Gases—Recovered Product Has High Commercial Value

By **H. F. JOHNSTONE**
Department of Chemistry, University of Illinois, Urbana, Ill.

THE results obtained in a co-operative investigation at the Engineering Experiment Station of the University of Illinois with the Utilities Research Commission, Inc., on the problem of the elimination of sulfur compounds from boiler-furnace gases are discussed by the writer in a paper presented to the American Society of Mechanical Engineers. Types of gas washers are compared from the standpoint of application to the large quantity of gas emitted from power-station boilers. It is shown that the possibility of economically washing these gases with untreated water is very remote. The limits imposed by the solubility of sulfur dioxide are those of the quantity of water required and the time and surface of contact needed. The calculated size of a washer for removing 80 per cent of the sulfur compounds from a gas containing 0.3 per cent SO_2 varies from 280,000 cu. ft. per 1,000,000 cu. ft. per min., for a bubble washer, to 860,000 cu. ft. for a spray washer. The contact required is approximately 4 sec. for the former and 51 sec. for the latter. Wetted-wall washers are intermediate in size and contact with 525,000 cu. ft. and 29 sec. The quantity of water required is roughly 75,000 gal. per 1,000,000 cu. ft. for each type. These figures agree in size with the results of the experimental plant at the Grove Road Station, from which the Battersea washing plant was designed. It is evident that the successful solution to the sulfur problem will not be found in a simple washing procedure, and further, that the possibility of finding a successful method will be greatly enhanced by the application of chemical engineering principles.

Removing Sulfur Dioxide from Flue Gases

A comprehensive study has been made of the catalytic oxidation method for removing the sulfur dioxide. In this case the gas is converted to sulfuric acid by reaction with oxygen from the flue gases after the two gases are dissolved. The possibility of reaction before absorption, as was suggested in the reports of English experiments, was investigated and found to be remote, the maximum oxidation being at 750 F., where about 2 per cent of the total sulfur dioxide was oxidized in the presence of flue dust. These results indicate the limitations to the catalytic method, for if it is necessary to absorb the necessary oxygen for the reaction, it is apparent that the time of contact cannot be greatly reduced. The capacity of water for absorbing sulfur dioxide, however, can be increased by the presence of catalysts to a point where the total quantity of water required is less than 1 per cent of that required when untreated water is used. The catalysts having the greatest power are the salts of manganese and iron.

Because of the slow absorption of oxygen, use of the oxidation method is only profitable when bubble washers can be used; that is, when the quantity of gas is so small that the power required for overcoming the draft loss is not serious. In this case the contact is less than one-sixth of that required for simple absorption. Another obstacle in the application of the oxidation method to flue gases is the poisoning effect of certain compounds on the oxidation reaction. Using wetted-wall or spray washers, it is impossible to obtain an acid concentration of greater than 3 per cent sulfuric acid because of this effect. Even with these results the absorption capacity of the water is still considerably greater than that of untreated water, but the by-product is of little value and may, in itself, present a disposal problem. The conclusion concerning the oxidation method, therefore, is that it is only available to waste gases other than those from power plants. Some applications to refinery gases and other chemical fumes have been reported.

Absorption by Alkaline Solutions

The rate of absorption of sulfur dioxide from flue gases by alkaline solutions has been measured in a packed tower washer and found to be nearly 50 times that when oxidation is used. A contact time of less than 1 sec. is required for approximately complete absorption. The disadvantage of using these substances has been in the cost of the chemical, which, in the case of lime, may reach a dollar a ton of coal.

It is possible to make use of high absorptive rates of alkaline solutions and regenerate the absorbing agent by heating to approximately 200 F. Several salts of ammonia have been found to have a high capacity when used in this way, absorbing and liberating as much as 6 per cent by weight of sulfur dioxide when used for washing flue gases. The method is attractive both from the mechanical and economical viewpoint, since the by-product sulfur dioxide, which is produced in the pure state, has a considerable market. Complete details of this process are being worked out.

Abstract of paper for the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y.

TVA to Buy Cement

THE Tennessee Valley Authority has decided to buy from commercial producers the six million barrels of cement required for the construction of dams, power plants and other improvements in the Tennessee Valley, instead of manufacturing its own cement. This decision followed opening of bids here. Prices for the cement delivered to two dams now under construction were: Norris dam $1.73 a barrel and Wheeler dam $1.87 a barrel.

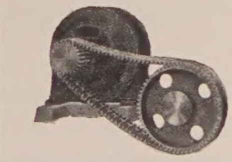
PROMAL CHAINS · BUCKETS

Last Longer

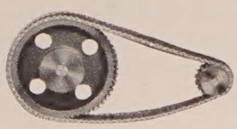
Promal, the tried and proved, stronger, longer-wearing metal for cast chains, buckets, etc., is proving itself by actual performance. Its qualities of greater strength, and resistance to abrasion and corrosion, are showing up in longer life in severe service.

Sprocket Wheels

Screw Conveyor



Silent Chain Drives



Roller Chain Drives

THIS sample of Link-Belt No. C-102-B Promal Chain was taken from bucket elevator handling highly abrasive material at the Independent Manufacturing Company, Philadelphia.

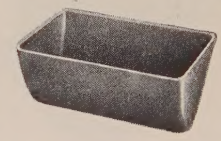
Since its installation in 1930, this Chain has carried approximately 45,000 tons of material. Not once during this time has this chain parted or given the slightest trouble, and it is probably good for several more years' service before it will even be necessary to replace the original pins.

This is typical of the performance reports of Promal Chains and Buckets, constantly being received from many sources.

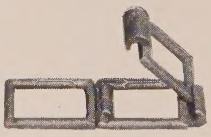
LINK-BELT COMPANY 5137A

CHICAGO INDIANAPOLIS PHILADELPHIA
SAN FRANCISCO Offices in Principal Cities TORONTO

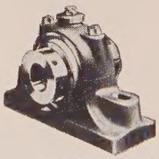
LINK-BELT



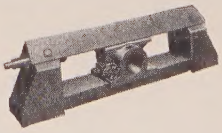
Elevator Buckets



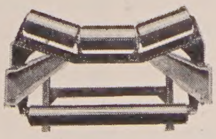
Chains of All Kinds



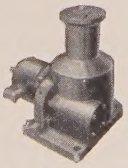
Bearings



Take-Ups



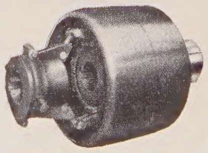
Belt Conveyors



Car Spotters

Bucket Elevators

Safety Collars

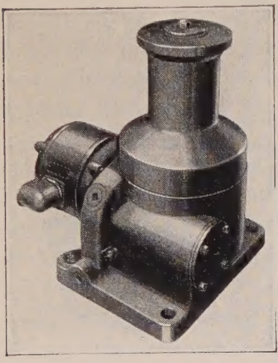


Friction Clutches

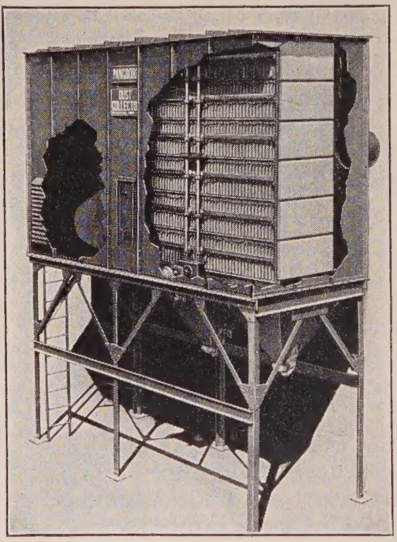
MILL EQUIPMENT

LINK-BELT'S vertical-capstan electric car spotter will hereafter be furnished "motorized," meaning that the motor will be attached direct to side of spotter housing, with the result that no motor shaft coupling or separate motor base plate will be required. With motor bolted to side of spotter housing, proper initial and permanent alignment of motor shaft is assured; and the plan measurements of foundation required are a minimum.

The Link-Belt motorized spotter, like its predecessor, is available in two sizes. The smaller machine has a rope pull of 5,000 pounds, and the larger size, 10,000 pounds. An eight-page illustrated book, No. 1392, covers this new product.



The motorized car spotter



This phantom photograph shows the dust collector from the clear air side

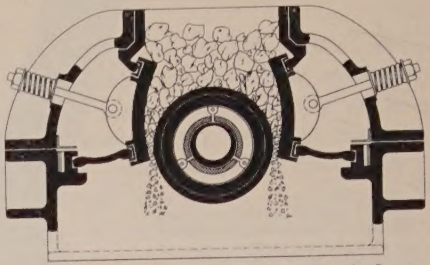
PANGBORN'S new type "CH" dust collector is described in Bulletin No. 197 recently issued by the Pangborn Corporation, Hagerstown, Md.

The makers claim this new all metal, cloth screen dust collector has fourteen exclusive features not previously available. Casings are available in three standard heights to accommodate four, five and six screens high, in either single or double collector types of any length, varying in 2 ft. 6 in. sections. Specific casing heights can be furnished to meet unusual conditions, they say.

◆ Manufacturers' News ◆

AMONG the orders recently received by The Northern Blower Co., of Cleveland, Ohio, are: a complete dust-collecting system at the new plant of the National Cement Co., Nazareth, Pa.; and another at the Yoch and Roberts crushed stone plant at Norristown, Pa. M. A. Eiben is president of the company.

BONNOT'S new reduction crusher has been designed to meet present-day conditions and represents the composite ideas of broadly experienced, practical operators and designing engineers, according to The Bonnot Company, of Canton, Ohio, makers of crushing, grinding and pulverizing equipment.



New Bonnot crusher—featuring slow creep mantle

Courtesy Pitt & Quarry

The cylinder or mantle does not revolve, but has a slight creeping action which insures uniform distribution of wear around the entire circumference, thus eliminating the tendency to wear the manganese in concentrated areas, they say. The company claims ten points of superior design, product and operating efficiency to meet the more exacting demand of present-day specifications for crushed materials—simplicity, ruggedness, low head room, positive force feed grease lubrication, easy discharge for wet material or clay balls, long life, true compression crushing avoiding rapid wear on accessible manganese wearing parts, 100 per cent overload safety, unusually high capacity, and very low power consumption.

There are two sizes, 4½ x 24 and 4½ x 36. The 4½ by 24 delivers 15 to 55 tons per hour, depending upon the setting of the crusher and the nature of the material. The 4½ x 36 delivers from 30 to 90 tons, depending upon the nature of the rock and the size of the material. These figures, they claim, are conservative and based on actual tests under average conditions.

◆ Industrial Literature ◆

JACKBITS, a bulletin listing the complete line of all sizes and types, has recently been issued by Ingersoll-Rand Company, New York City, illustrating and describing the Jackbit and Jackbit Rod, both with center and side holes, and in the 4-point and 6-point style.

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CHASE Mine Cars is the title of one of two new leaflets recently issued by The Chase Foundry & Manufacturing Co., of Columbus, Ohio. This company has been producing this type of equipment for a number of years.

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PUMPING Units and Air Compressors, bulletins Nos. 223 and 104, have just been issued by the Pennsylvania Pump & Compressor Co., Easton, Pa.